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# IDAHO
# DEPARTMENT OF FISH AND GAME

**Jerry M. Conley, Director**

**FEDERAL AID IN FISH RESTORATION**

**Job Performance Report**
**Project F-71-R-13**

**REGIONAL FISHERIES MANAGEMENT INVESTIGATIONS**

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| Job No. 3 (MC)-a. | McCall Subregion Mountain Lakes Investigations |
| Job No. 3 (MC)-b[1]. | McCall Subregion Lowland Lakes and Reservoirs Investigations |
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| Job No. 3 (MC)-c. | McCall Subregion Rivers and Streams Investigations |
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**By**

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JOB **PERFORMANCE REPORT**

State of: Idaho

Name: Regional Fishery Management Investigations

Project No.: F-71-R-13

Title: McCall Subregion Mountain Lakes Investigations

Job No. 3 (MC)-a

Period Covered: July 1, 1988 to June 30, 1989


**ABSTRACT**

Brown trout have been stocked in several mountain lakes in the McCall Subregion during 1987 and 1988 to serve as a biological control for brook trout, and secondarily, to provide additional fishing opportunities. The success of brown trout stockings were assessed in 1988 using gill nets and hook-and-line in Deep Lake, located northeast of Upper Payette Lake in the North Fork Payette River drainage.

Brown trout successfully over-wintered in Deep Lake, although a total of only five fish from the 1987 plant were collected. These fish averaged 194 mm long and had a mean weight of 37 g. The 1987 plant had a mean Fulton condition factor of 0.51. Brook trout were readily captured by gill nets and hook-and-line.



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## OBJECTIVES

To maintain information for fishery management activities and decisions for mountain lakes.

## RECOMMENDATIONS

1. Continue to assess the success of brown trout introductions in mountain lakes.

2. Stock potential predator species in additional mountain lakes where stunted brook trout are established.

3. Continue species diversity program in mountain lakes to supply additional fishing opportunities, and develop a program to gather needed baseline data regarding mountain lake fisheries.

## INTRODUCTION

During the past several years, experimental stockings of both fall chinook salmon Oncorhynchus tshawytscha and brown trout Salmo trutta have been made in mountain lakes in the McCall Subregion of the Idaho Department of Fish and Game (IDFG). The primary purpose of these stockings has been to control populations of stunted brook trout Salvelinus fontinalis, and secondarily, to provide diversified fishing opportunities. Fall chinook salmon plants were unsuccessful at controlling brook trout populations in the Grassy Mountain Lakes located in the Little Salmon River drainage (Scully and Anderson 1989), and subsequently, future salmon stockings were discontinued.

As reported by Scully and Anderson (1989), brown trout were introduced to both Deep and Rapid lakes in 1987. These lakes are in the North Fork Payette River drainage near the town of McCall at an elevation of 2,250 m. Brown trout stocked in both lakes on July 9, 1987, averaged 99 mm in length and were 66 fish/kg (Bob Esselman, IDFG, personal communication).

## TECHNIQUES USED

Brown trout were again stocked in both Deep and Rapid lakes on July 6, 1988, following methods employed by Scully and Anderson (1989). Approximately 1,005 fish at 33 fish/kg were planted per lake. Additionally, brown trout fingerlings were stocked the same day at Trail Lake (Twp. 21N, Rge. 4E, Sec. 14), Skein Lake (Twp. 13N, Rge. 3E, Sec. 9), and North Fork Kennally Lake #2 (Middle Kennally Lake; Twp. 17N., Rge. SE., Sec.. 6), which are all located in the North Fork Payette River drainage. These three lakes each received about 1,005 fish at 33 fish/kg.

To assess the success of the 1987 brown trout stocking in Deep Lake, gill nets were set in July 1988. No follow up to the 1987 Rapid Lake plant was made in 1988. At Deep Lake a total of 4 gill nets were packed into and set on July 14, and left to fish overnight. Trout populations were also sampled with rod and reel on July 14.

From all trout collected, total length and weight were taken. Fulton's condition factor (K) was calculated for trout where:

$$K = \frac{W_X}{L^3} X$$

W = weight in grams, L = length in millimeters, and X is an arbitrary scaling constant, in this case 100,000.

## RESULTS

Brown trout successfully over-wintered in Deep Lake, although a total of only 5 fish from the 1987 stocking were collected (4 in gill nets, 1 hook-and-line). These fish averaged 194 mm in length (range 184 mm to 201 mm) and weighed an average of 37 g (range 30 g to 45 g). The average size of brown trout that were stocked in 1987 nearly doubled during the course of one year in Deep Lake. Brown trout were typically in poor body condition with an average K factor of 0.51 (range 0.39 to 0.58). Also, 25 brown trout fingerlings from the 1988 stocking were collected in gill nets.

Brook trout were readily captured by both gill nets (n=25) and hook-and-line (n=26). Mean length and weight for brook trout sampled by gill nets was 171 mm (range 120 mm to 299 mm) and 38 g (range 5 g to 145 g), respectively, with an average K of 0.49 (range 0.17 to 0.72). Mean length and weight for brook trout sampled with hook-and-line was 199 mm (range 151 mm to 240 mm) and 49 g (10 g to 90 g), respectively, with an average K of 0.59 (range 0.29 to 0.79).

## DISCUSSION

Although it is encouraging that brown trout stocked at Deep Lake in 1987 survived into 1988, it is premature to suggest any direct influence on brook trout either through predation or competition for food and space. Annual sampling for several years in a number of alpine lakes is warranted prior to making any conclusions on the merits of brown trout as a management tool to control unbalanced brook trout populations, or to establish a supplemental fishery in mountain lakes. Additional alternative species introductions in mountain lakes should be considered only if no significant potential impacts are foreseen in drainages inhabited by important native salmonids.

## LITERATURE CITED

Scully, R., and D.R. Anderson. 1989. Federal Aid in Fish Restoration. Regional Fisheries Management Investigations. Job Performance Report. Project F-71-R-12. Idaho Department of Fish and Game. Boise.

JOB PERFORMANCE REPORT

Sate of: Idaho

Name: Regional Fishery Management Investigations

Project No.: F-71-R-13

Title: McCall Subregion Lowland Lakes and Reservoirs Investigations

Job No.: 3 _ (MC)-b[l]

Period Covered: July 1, 1988 to June 30, 1989


**ABSTRACT**

**Horsethief Reservoir**

Annual creel survey results from Horsethief Reservoir over the 1988 Memorial Day weekend suggested much reduced angler effort than in past years. Catchable rainbow trout composed 97% of the total catch. A combined catch rate of 0.31 trout/hr was observed. A sample of 23 anglers interviewed favored the recently instated year round fishing season.

**Little Payette Lake**

Following chemical rehabilitation in 1987, Little Payette Lake was restocked the following spring with Kamloops rainbow trout and Pennask Lake rainbow trout. An excellent fishery developed for these strains throughout 1988. However, gill net samples conducted in October 1988 documented the reinvasion of the system by nongame fish. It is speculated that nongame species gained access to the lake via the low water outlet pipe during a minimum pool situation and/or were survivors of the chemical rehabilitation. Smallmouth bass were introduced in an effort to partially control nongame populations.

**Lost Valley Reservoir**

Gillnetting performed in 1988 revealed good holdover of 1986 and 1987 fingerling stockings. However, due to consecutive drought years and a potential winterkill, salvage limits were adopted at Lost Valley Reservoir by the Fish and Game Commission on September 1, 1988. It is apparent the trout fishery needs rebuilding.

## Oxbow-Hells Canyon Reservoir Complex

Smallmouth bass populations were sampled with electrofishing and hook-and-line gear in late May 1988 from both Oxbow and Hells Canyon reservoirs. Back-calculated lengths and growth increments estimated for both populations were comparable to growth data reported for other Idaho waters, at least through age V. Additional population indices and dynamics information are reported and discussed.

## Upper Payette Lake

Anglers expended nearly 16,000 hours of effort at Upper Payette Lake during June through September 1988. An overall catch rate of 0.70 trout/hr was observed.- Total trout catch exceeded 12,000 fish with hatchery trout comprising 97% of total catch. Approximately 59% of the catchable rainbow trout stocked were caught by anglers.

A total of 114 fish of six species were captured in gill nets set in June 1988. Mountain whitefish comprised 63% of the sample, while nongame species made up 30%.

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## OBJECTIVES

To maintain information for fishery management activities and decisions for lowland lakes and reservoirs.

## RECOMMENDATIONS

1. Continue the annual creel survey at Horsethief Reservoir during Memorial Day weekend as needed. Stock 2,000 brown trout annually to provide a large fish component to the harvest.

2. Develop an effective upstream migration barrier below Little Payette Lake to eliminate movements of nongame fish via Lake Fork Creek. Consider future chemical rehabilitation of the lake once improvements are made and when it is biologically warranted.

3. Stock additional smallmouth bass in Little Payette Lake, monitor reproduction and potential impacts to nongame fish species.

4. Rebuild the fishery at Lost Valley Reservoir and chemically rehabilitate if yellow perch inhibit trout performance.

5. Assess forage availability and suitability for smallmouth bass in the Oxbow-Hells Canyon complex, and document exploitation of bass through creel survey.

6. Document return to the creel of catchable rainbow trout in subregional waters by jaw tagging.

7. Consider alternative management options for Upper Payette Lake for something other than catchable rainbow trout, such as a quality trout or speciality trout scenario.

## INTRODUCTION

### Horsethief Reservoir

Horsethief Reservoir, a 110 ha impoundment located 12 km east of Cascade, Idaho, is a popular fishery, particularly for family groups. The greatest fishing pressure had typically occured during the traditional opening of the general fishing season over the Memorial Day weekend. The fishery is supported primarily by annual fingerling rainbow trout stockings made periodically during the fishing season. Catchable rainbow trout have been stocked to augment the fishery in 1983 and 1988. Since 1974, the Idaho Department of Fish and Game (IDFG) has kept annual records of angler statistics at Horsethief Reservoir during the traditional fishing season opening weekend.

The reservoir was chemically treated in 1983 to eliminate a stunted yellow perch population which was established illegally. Since that time, fishing has been stable and of high quality.

Beginning in 1988, the fishing season at Horsethief Reservoir was lengthened considerably by the IDFG from general season to year-round angling. The season change was instituted to provide additional fishing opportunities and because no real biological basis existed to justify the shorter season since the impoundment was designated as a hatchery-supported rainbow trout fishery.

## Little Payette Lake

Little Payette Lake was chemically rehabilitated with rotenone in October 1987 (Scully and Anderson 1989). Trophy trout regulations (2 fish, 508 mm minimum size limit, artificial flies and lures, single barbless hook) and a restricted fishing season (Memorial Day weekend through November 30) were adopted by the Fish and Game Commission beginning in 1988.

In May 1988, the lake was restocked with two strains of trout, a domestic Oregon strain of Kamloops rainbow trout, and a feral strain of rainbow trout obtained from Pennask Lake, British Columbia, Canada.

In August 1987, prior to chemical treatment, the IDFG Engineering Bureau constructed a migration barrier immediately downstream from the spillway outlet of Little Payette Lake (Scully and Anderson 1989) to eliminate movements of nongame fish into the lake. No improvement work was performed on the low water outlet pipe since measured velocities (3.3 m/sec to 5.5 m/sec) were deemed sufficient to block upstream migrations.

## Lost Valley Reservoir

Lost Valley Reservoir was previously described by Scully and Anderson (1989). The system was treated with rotenone in October 1985 to eliminate stunted yellow perch. Lost Valley Reservoir was restocked in the spring and summer of 1986 and a good trout fishery was documented throughout the summer of 1986. In 1987, a May through September creel survey was conducted where anglers fished an estimated 59,323 hours, caught approximately 25,000 trout, and had an overall catch rate of 0.45 trout/hour (Scully and Anderson 1989).

## Oxbow-Hells Canyon Reservoir Complex

Smallmouth bass were first stocked into the Snake River in 1942 by Idaho Department of Fish and Game personnel (Keating 1970). Since that time, smallmouth bass have become well established throughout the mainstem Snake River and tributaries. Several authors (Munther 1967; Keating 1970;

Lukens 1986) have documented life history characteristics and population dynamics of lower Snake River smallmouth bass populations. Anderson et al. (1987) reported on bass populations found in the Oxbow-Hells Canyon reservoirs complex on the Snake River, located upriver from the previously mentioned studies (Figure 1). However, the scope of their project did not include assessing population dynamics of these stocks.

In 1985, the Fish and Game Commission adopted statewide bass regulations, where appropriate, in order to enhance over-exploited bass fisheries. These regulations (305 mm minimum size, 5 fish limit, only 2 over 406 mm) were initiated to improve stock structure by providing more "quality"-size bass for anglers. Since that time, most bass fisheries in Idaho have been analyzed to document responses of individual populations to the regulation change. In 1988, Fish and Game personnel from the McCall Subregion sampled bass stocks from both Oxbow and Hells Canyon reservoirs to assess age and growth, mortality, and other population indices in order to provide this information.

## Upper Payette Lake

Upper Payette Lake is one of three Payette lakes (the other two are Payette Lake and Little Payette Lake) in west-central Idaho near the town of McCall, in the North Fork Payette River drainage. The lake has a full pool surface area of 128 ha, a maximum depth of 27 m, and lies at an elevation of 1,693 m. Upper Payette Lake drains a steep forested watershed of approximately 68 $km^2$. Storage capacity of the natural lake was increased in 1953 by nearly 3.8 x $10^6$ $m^3$ (3,000 acre-feet) with construction of a water control structure at the outlet by the Lake Reservoir Company. Limited imnological data from Idaho Department of Fish and Game files (circa 1966) suggests low productivity (total dissolved solids = 1.2 mg/l, total hardness = 2.7 mg/l, pH = 6.6) and high water clarity (8 m).

Little fishery information has been gathered at Upper Payette Lake since the early 1970s when Welsh (1972, 1973) conducted consecutive creel surveys in 1971 and 1972. Upper Payette Lake was chemically treated with antimycin in August 1970 to eradicate nongame fish species. Following chemical treatment, Upper Payette Lake was replanted with fingerling and catchable size rainbow trout. Prior to treatment in 1970, nongame species present in Upper Payette Lake were northern squawfish, redside shiner, and unidentified suckers and dace. A summary of the stocking history of Upper Payette Lake is found in Appendix 1.

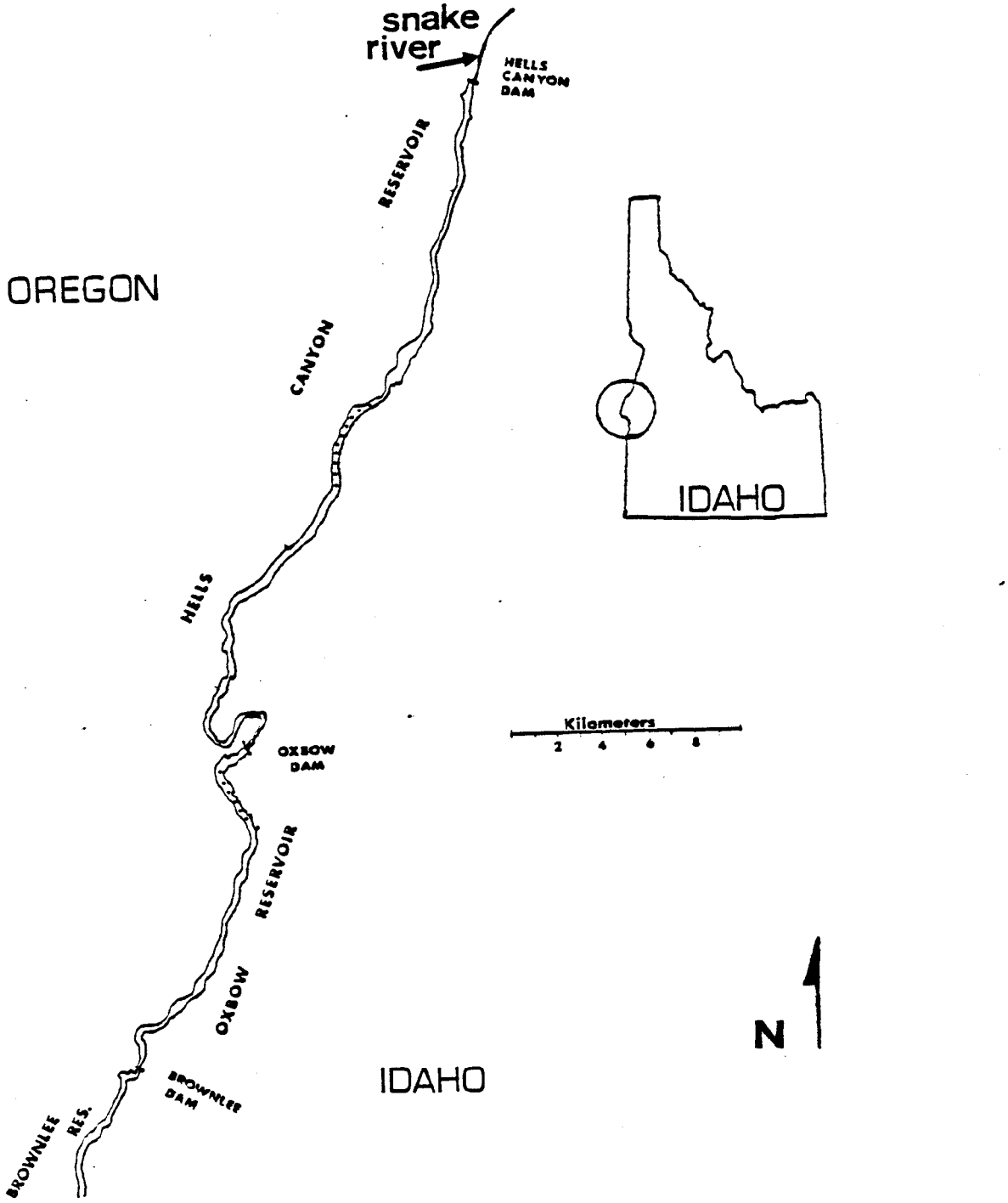


Figure 1. Location map of Oxbow and Hells Canyon Reservoirs, Snake River, between Oregon and Idaho.

## TECHNIQUES USED

### Horsetheif Reservoir

IDFG personnel conducted angler counts and interviews at Horsethief Reservoir during the Memorial Day weekend (May 27-28) 1988 using techniques previously described by Anderson and Roberston (1985) and Anderson et al. (1987).

Additionally, a sample of anglers were interviewed concerning their opinion of the regulation change from general to year-round season.

### Little Payette Lake

Approximately 10,000 each of both Kamloops rainbow trout and Pennask Lake rainbow trout were stocked into Little Payette Lake in. late May and early June 1988, respectively. Total length and weight were measured from a sample of the Kamloops plant prior to stocking to document mean length and to calculate Fulton's condition factor (K) as follows:

$$K = \frac{W_3}{L^3} X \text{ where,}$$

K = Fulton-type condition factor
W = weight in grams
L = length in millimeters
X = scaling constant of 100,000

No physical measurements were gathered from the Pennask Lake trout before stocking, however a standard pound count (number of fish per pound) was taken.

On September 27 a total of 5 horizontal gill nets were placed in a northeastern area of Little Payette Lake. Nets were fished overnight and pulled between 0830 and 1330 hours on September 28. Three experimental gill nets, 38.1 m long, with mesh sizes between 25 mm and 127 mm, and individual panels of 7.6 m in length were set, along with one net composed of two 15 m long pieces (19 mm and 25 mm mesh), and one exploratory net, 38.1 m long, composed of 25 mm mesh. All game fish were identified, counted, and released except for net mortalities which were measured for total length and weight.

### Lost Valley Reservoir

On June 15, three variable mesh gill nets and one 1.9 cm stretched mesh net, were set overnight in Lost Valley Reservoir. The nets were set in water depths ranging from 1.8 m to 6.0 m. Nets were pulled the following morning, and data collected were species and number, and length and weight for all game fish captured.

Approximately 30,000 fingerling rainbow trout of both the McConnaughy and Eagle Lake strains were stocked in Lost Valley Reservoir in the summer of 1988. The McConnaughy fingerling received a left ventral fin clip, while the Eagle Lake fish were not marked.

## Oxbow-Hells Canyon Reservoir Complex

Smallmouth bass were collected using electrofishing gear (pulsed DC mode) along near-shore areas from both Oxbow and Hells Canyon reservoirs during May 24-25, 1988. Additionally, hook-and-line sampling was used to supplement electrofishing samples. Parameters recorded from bass were total length and weight. Scales were collected from all bass sampled.

Impressions of smallmouth bass scales were made on acetate slides following procedures described by Lukens (1986). Scales were analyzed on a microfiche projector with a magnification of 40 X. Length-at-age was back-calculated using the Fraser-Lee method with a standard y-intercept value of 35 mm (Carlander 1982).

Length-frequency data were plotted in 10 mm increments of length. The proportional stock density (PSD) index (Anderson 1976), a measure of stock structure, was calculated using length-frequency data from electrofishing samples. Stock and quality sizes for smallmouth bass are 180 mm and 280 mm, respectively (Anderson 1980). The relative stock density (RSD) index as described by Wege and Anderson (1978) was used to describe the percentage of preferable-size (350 mm +) smallmouth bass. Relative weights ($W_r$) were calculated following methods described by Wege and Anderson (1978) as a measure of the condition of individual fish. Mean $W_r$ values were calculated for 50 mm length groups.

Catch curves were generated from age-frequency distributions of bass populations as sampled by electrofishing gear. Annual survival rates (S) were derived from age-frequency distributions of samples as suggested by Robson and Chapman (1961). Survival rates were calculated for those segments of the age-frequency distribution which appeared fully vulnerable to electrofishing. Total annual mortality (A) was simply derived from the formula 1-S (Ricker 1975).

## Upper Payette Lake

A creel survey was conducted at Upper Payette Lake from June through September 1988. The type of survey used was similar to that performed by Anderson et al. (1987) at Cascade Reservoir. Upper Payette Lake was not blocked into survey sections because of its small size. Fishery statistics were calculated after methods reported by Anderson et al. (1987).

At the onset of the creel survey, horizontal experimental gill nets were set to assess relative species composition of the existing fish community. A total of four nets were set, two variable mesh and two single mesh. Gill nets were set during the evening of June 7 and left to sample until the morning of June 8. Nets were set at water depths ranging from 2.0 m to 8.0 m. Total length was measured on all fish collected.

## RESULTS

### Horsetheif Reservoir

Angler effort was considerably lower over the Memorial Day weekend in 1988 than in past years (Table 1). However, only one day of the weekend was surveyed because of inclement weather. Total trout harvest was estimated at 470 fish, with rainbow trout comprising 97% of the catch, and cutthroat trout and rainbow X cutthroat hybrids making up the remaining 3% (Table 1). A combined catch rate of 0.31 trout/hr was estimated from angler interviews. Tube anglers enjoyed the highest catch rate (1.1 trout/hr), while boat anglers experienced catch rates less than 0.25 trout/hr (Table 1). Overall, fishery statistics documented in 1988 at Horsethief Reservoir over the Memorial [lay weekend were significantly lower than recorded mean values (Table 1).

Rainbow trout averaged 286 mm + 30 mm SD long (n=87) in the creel and ranged from 240 mm to 340 mm. Average length of rainbow trout was similar *to that recorded during the period of 1985 to 1986, but less than that in 1987. Several holdovers from the 1987 subcatchable plants were harvested and ranged from 360 mm to 440 mm in length.

Of 23 anglers interviewed, 52% favored the year-round fishing season at Horsethief Reservoir. Anglers interviewed prior to the traditional opener strongly favored the year-round season.

### Little Payette Lake

A mean Fulton-type condition factor of 1.1 + 0.14 SD was calculated from a sample of 97 Kamloops rainbow trout prior to stocking (Appendix 2). Average total length was 213 mm + 16 mm SD and mean weight was 109 g + 26 g SD.

At the time of stocking in early June 1988, Pennask rainbow trout averaged 364 fish/kg and ranged between 75 mm to 125 mm in total length (D. Scully, IDFG, personal communication).

In late summer 1988, the IDFG received several undocumented reports by anglers that northern squawfish Ptychocheilus oregonensis young-of-the-year were seen in shallow shoreline areas of Little Payette Lake.

Table 1. Opening weekend angler use and harvest data for Horsethief Reservoir, 1974 to 1988.

| Year | Effort (hours) | Species: Brook trout | Species: Cutthroat and hybrids | Species: Rainbow trout | Species: Total trout | Trout per hour: Boat | Trout per hour: Bank | Trout per hour: Tube | Trout per hour: Combined |
|---|---|---|---|---|---|---|---|---|---|
| 1974 | 12,134 | 0 | 0 | 7,444 | 7,444 | -- | -- | -- | 0.61 |
| 1975 | 7,786 | 8 | 0 | 3,137 | 3,145 | -- | -- | -- | 0.40 |
| 1976 | 12,345 | 224 | 149 | 9,944 | 10,342 | -- | -- | -- | 0.84 |
| 1977 | 7,443 | 51 | 148 | 4,620 | 4,744 | -- | -- | -- | 0.64 |
| 1978 | 8,847 | 18 | 27 | 3,040 | 3,067 | -- | -- | -- | 0.34 |
| 1979 | 5,876 | 197 | 329 | 1,909 | 2,435 | 0.21 | 0.48 | 1.53 | 0.41 |
| 1980 | 3,167 | 12 | 0 | 6,044 | 6,044 | 2.60 | 0.98 | 5.13 | 1.91 |
| 1981 | 362[a] | -- | -- | 376 | -- | -- | -- | -- | 1.04 |
| 1982 | 8,688 | 167 | 142 | 4,759 | 5,058 | 0.77 | 0.52 | 1.17 | 0.62 |
| 1983 | 4,685 | 89 | 25 | 2,153 | 2,267 | 0.53 | 0.52 | 0.31 | 0.48 |
| 1984 | 3,477 | 1 | 0 | 1,379 | 1,380 | 0.87 | 0.12 | 0.68 | 0.40 |
| 1985 | 6,205 | 0 | 0 | 8,982 | 8,980 | 1.70 | 1.33 | 1.57 | 1.45 |
| 1986 | 7,940 | 1 | 0 | 6,271 | 6,272 | 0.90 | 0.78 | 0.50 | 0.79 |
| 1987 | 6,452 | 13 | 0 | 4,489 | 4,589 | 0.95 | 0.53 | 1.03 | 0.67 |
| 1988 | 1,905[b] | 0 | 5 | 458 | 470 | 0.23 | 0.39 | 1.13 | 0.31 |
| Means[c] | 7,311 | 52 | 59 | 4,616 | 5,059 | 0.97 | 0.63 | 1.45 | 0.76 |

[a]Only catch rate was calculated from a sample of anglers.
[b]Only one day of weekend was surveyed; first year of year-round fishing.
[c]Does not include data from 1981 and 1988 since incomplete information available.

Gillnetting documented that nongame fish species are again present in Little Payette Lake. A total of 440 fish were caught in gill nets in late September 1988 (Table 2). Nongame fish comprised 93% of the sample with redside shiners Richardsonius balteatus being the predominant species followed by northern squawfish and largescale sucker Catostomus macrocheilus. Rainbow trout made up the remaining 7% of the sample (Table 2). Eighty-three percent of the sample was collected in the gill net composed of 19 mm and 25 mm mesh sizes.

All nongame fish collected were thought to be 1988 cohorts. Largescale suckers were typically 100 mm to 150 mm long, northern squawfish were 75 mm to 100 mm long, and redside shiners were 50 mm to 75 mm long.

The 31 rainbow trout (18 Pennask Lake, 13 Kamloops) collected were generally in excellent body condition. Fulton-type condition factors calculated for the 16 Pennask Lake rainbow trout mortalities averaged 0.90 $\pm$ 0.15 SD (Appendix 3). These same fish averaged 170 mm (+ 29 mm SD) long and 50 g (+ 37 g SD) in weight. Ranges in lengths and weights of this sample were 141 mm to 243 mm and 14 g to 160 g, respectively.

Smallmouth bass Micropterus dolomieui were introduced into Little Payette Lake on October 13, 1988, in an effort to provide an effective predator component to the system. Approximately 200 bass were collected with electrofishing gear mounted in a drift boat from the Payette River between the towns of New Plymouth and Payette, and then transported to Little Payette Lake. Smallmouth bass were selected since they already existed in the North Fork Payette River drainage, they are known to prey on cyprinids, they may compete with nongame fish for food and space, no serious competition with stocked salmonid is anticipated, and a low level bass fishery might be established.

## Lost Valley Reservoir

A total of 63 game fish of three species were captured in four gill nets. Ninety-eight percent of the sample was caught in the variable mesh nets. The sample was composed of 54 rainbow trout, four brook trout, and five yellow perch. Thirty percent of the rainbow trout were from the 1987 fingerling plant and averaged 272 mm long (+ 16 mm SD with a range from 250 mm to 300 mm). The majority of the rainbow trout were 1986 fingerling and catchable plants and averaged 377 mm (range 320 mm to 420 mm). Brook trout averaged 251 mm (range 210 mm to 305 mm), while yellow perch averaged 154 mm (range from 95 mm to 210 mm).

Table 2. Results of horizontal gillnetting in Little Payette Lake on September 27 to 28, 1988. Percentage of total sample in parentheses.

| Type of net | Number of nets | NSQ | RSS | LSS | PRB | KRB | Total | Number fish per net |
|---|---|---|---|---|---|---|---|---|
| 15.2 m of 19 mm mesh size and 15.2 m of 25 mm mesh size spliced together | 1 | 92 (25) | 258 (70) | 2 (<1) | 14 (4) | 0 (0) | 366 | 366 |
| 38.1 m of 25 mm mesh size | 1 | 1 (20) | 0 (0) | 4 (80) | 0 (0) | 0 (0) | 5 | 5 |
| 38.1 m of 25 mm to 127 mm mesh size, each panel 7.6 m long | 3 | 37 (54) | 1 ( 1) | 14 (20) | 4 (6) | 13 (19) | 69 | 23 |
| Totals | 5 | 130 (30) | 259 (59) | 20 (4) | 18 (4) | 13 (3) | 440 | 88 a/ |

[a]Total number of fish collected (440) divided by number of nets (5).

NSQ - northern squawfish
RSS - redside shiner
LSS - largescale sucker
PRB - Pennask Lake rainbow trout
KRB - kamloops rainbow trout

## Oxbow-Hells Canyon Reservoir Complex

### Oxbow Reservoir

Smallmouth bass sampled from Oxbow Reservoir in late May 1988, were represented by year classes 1981-1987 (Table 3). Back-calculated annual growth increments averaged 54 mm, discounting the increment of 100 mm between annuli 5 and 6 (Table 3). No age 1+ bass were collected, and thus, not included in back-calculations of growth.

Back-calculated lengths and annual growth increments estimated for the smallmouth bass population from Oxbow Reservoir appear comparable to growth data reported for other Idaho waters, at least through age class 5 (Tables 4 and 5). Bass in Oxbow Reservoir appear on average to reach the minimum harvestable size (305 mm) between ages 4 and 6 (Table 3).

Smallmouth bass sampled by electrofishing gear at Oxbow Reservoir in late May, 1988, averaged 204 mm long and ranged from 130 mm to 433 mm (Figure 2), while bass sampled with hook-and-line gear averaged 252 mm long and ranged from 146 mm to 302 mm (Figure 3). Bass from combined samples averaged 221 mm (Figure 4).

The PSD index for the May electrofishing sample of smallmouth bass was about 15% with an RSD-350 index for the same sample of 0.92%. The PSD index for the hook-and-line sample was 22Z with an RSD-350 index of 0.0%.

The total length-weight relationship for smallmouth bass from Oxbow Reservoir derived from electrofishing samples only is described by the equation $Y = 3.57'6^{(L3.23)}$ (Figure 5).

Relative weights calculated for individual smallmouth bass from the electrofishing sample were grouped well below the optimum $W_r$ of 100 (Figure 6). Mean $W_r$ for bass per 50 mm length group ranged between 82 to 99, with a weighted mean $W_r$ of 86 (Table 6).

Total annual mortality for smallmouth bass ages 3-7 was estimated as 0.616 (Figure 7).

### Hells Canyon Reservoir

Smallmouth bass sampled from Hells Canyon Reservoir in late May, 1988, were represented by year classes 1980-1987 (Table 7). Back-calculated annual growth increments averaged 47 mm (Table 7).

Back-calculated lengths and annual growth increments estimated for the smallmouth bass population from Hells Canyon Reservoir was comparable to Oxbow Reservoir bass, and growth data reported for other Idaho waters (Tables 4 and 5). Bass in Hells Canyon Reservoir appear on average to reach the minimum harvestable size (305 mm) between ages 4 and 6 (Table 7).

Table 3. Back-calculated lengths at age (mm) for a sample of smallmouth bass collected by electrofishing and rod and reel in Oxbow Reservoir, May 24-25, 1988. The correction factor (a) used in the analysis was 35 mm. Standard deviations are shown in parentheses.

| Age Class | Year Class | Number of Fish | Mean Length at Capture (mm) | Mean length at annulus | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I | 1987 | 0 | - | - | - | | | | | |
| II | 1986 | 58 | 153 | 83(7.5) | 147(12.2) | | | | | |
| III | 1985 | 35 | 206 | 74(8.2) | 147(13.2) | 199{16.4) | | | | |
| IV | 1984 | 90 | 260 | 76(6.7) | 147(16.9) | 220(18.3) | 253(18.1) | | | |
| V | 1983 | 6 | 303 | 78(7.5) | 156(29.7) | 243(30.0) | 274(14.9) | 295(13.1) | | |
| VI | 1982 | 0 | - | - | - | - | -- | -- | -- | |
| VII | 1981 | 1 | 433 | 81 | 150 | 246 | 339 | 390 | 409 | 426 |
| Number of fish | | 190 | | 190 | 190 | 132 | 97 | 7 | 1 | 1 |
| Weighted mean length | | | | 78 | 147 | 216 | 255 | 309 | 409 | 426 |
| Increment of growth | | | | 78 | 69 | 69 | 39 | 54 | 100[a] | 17 |

[a]sample size n = 1.

Table 4. Comparison of weighted mean back-calculated lengths (mm) at annuli formation for smallmouth bass populations sampled in Idaho waters.

| Area | Year sampled | Sample size | Mean length at annulus | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Oxbow Reservoir | 1988 | 190 | 78 | 147 | 216 | 255 | 309 | 409 | 426 | -- | -- |
| Hells Canyon Reservoir | 1988 | 180 | 75 | 146 | 209 | 259 | 294 | 325 | 359 | 376 | |
| Malad River[a] | 1987 | 44 | 78 | 154 | 205 | -- | -- | -- | -- | -- | -- |
| Anderson Ranch Reservoir[s] | 1987 | 81 | 71 | 132 | 204 | 250 | 282 | 312 | -- | -- | -- |
| Snake River Hells Canyon[b] | 1985 | 157 | 88 | 154 | 218 | 264 | 304 | 348 | 399 | 436 | 467 |
| Brownlee Reservoir[s] | 1983 | 384 | 72 | 157 | 235 | 299 | 353 | 383 | 421 | 468 | -- |
| Snake River below Salmon River[d] | 1965-1967 | 155 | 85 | 145 | 205 | 240 | 267 | 291 | 309 | 324 | -- |

[a]from Grunder et al. (1989). Used Fraser-Lee Method and 35 mm correction factor.
[b]from Lukens (1986). Used Lee Method and regression analysis.
[c]from Rohrer and Chandler (1985).
[d]from Keating (1970). These are unweighted data.

Table 5. Comparisons of mean growth increments (mm) for smallmouth bass populations sampled in Idaho waters.

| Area | Year sampled | Sample Size | Mean growth in increment (mm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Oxbow Reservoir | 1988 | 190 | 78 | 69 | 69 | 39 | 54 | - | 17 | -- | -- |
| Hells Canyon Reservoir | 1988 | 180 | 75 | 71 | 63 | 50 | 35 | 31 | 34 | 17 | -- |
| Malad River[a] | 1987 | 44 | 78 | 76 | 51 | -- | -- | -- | -- | -- | -- |
| Anderson Ranch Reservoir[a] | 1987 | 81 | 71 | 61 | 72 | 46 | 32 | 30 | -- | -- | -- |
| Snake River Hells Canyon[b] | 1985 | 157 | 88 | 66 | 64 | 46 | 40 | 44 | 51 | 36 | 31 |
| Brownlee Reservoirs[c] | 1983 | 384 | 72 | 85 | 78 | 64 | 54 | 30 | 38 | 47 | |
| Snake River below Salmon River[d] | 1965-1967 | 155 | 85 | 60 | 60 | 35 | 27 | 24 | 18 | 15 | |

[a]From Grunder et al. (1989).
[b]From Lukens (1986).
[c]From Rohrer and Chandler (1985).
[d]From Keating (1970). These data were calculated from unweighted mean back-calculated lengths at annuli formation.

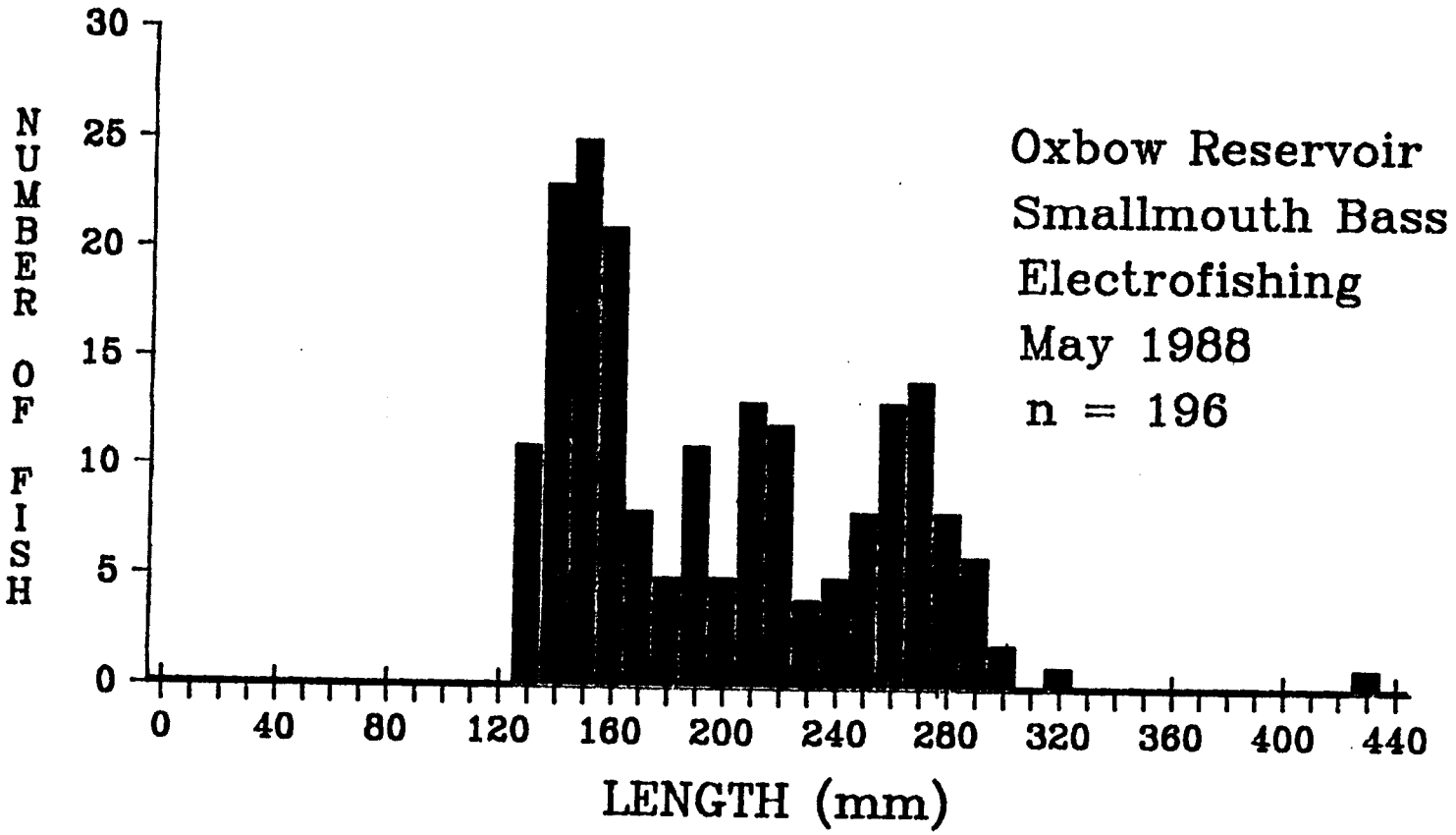


Figure 2. Length-frequency diagram of a sample of smallmouth bass collected by electrofishing gear from Oxbow Reservoir, May 1988.

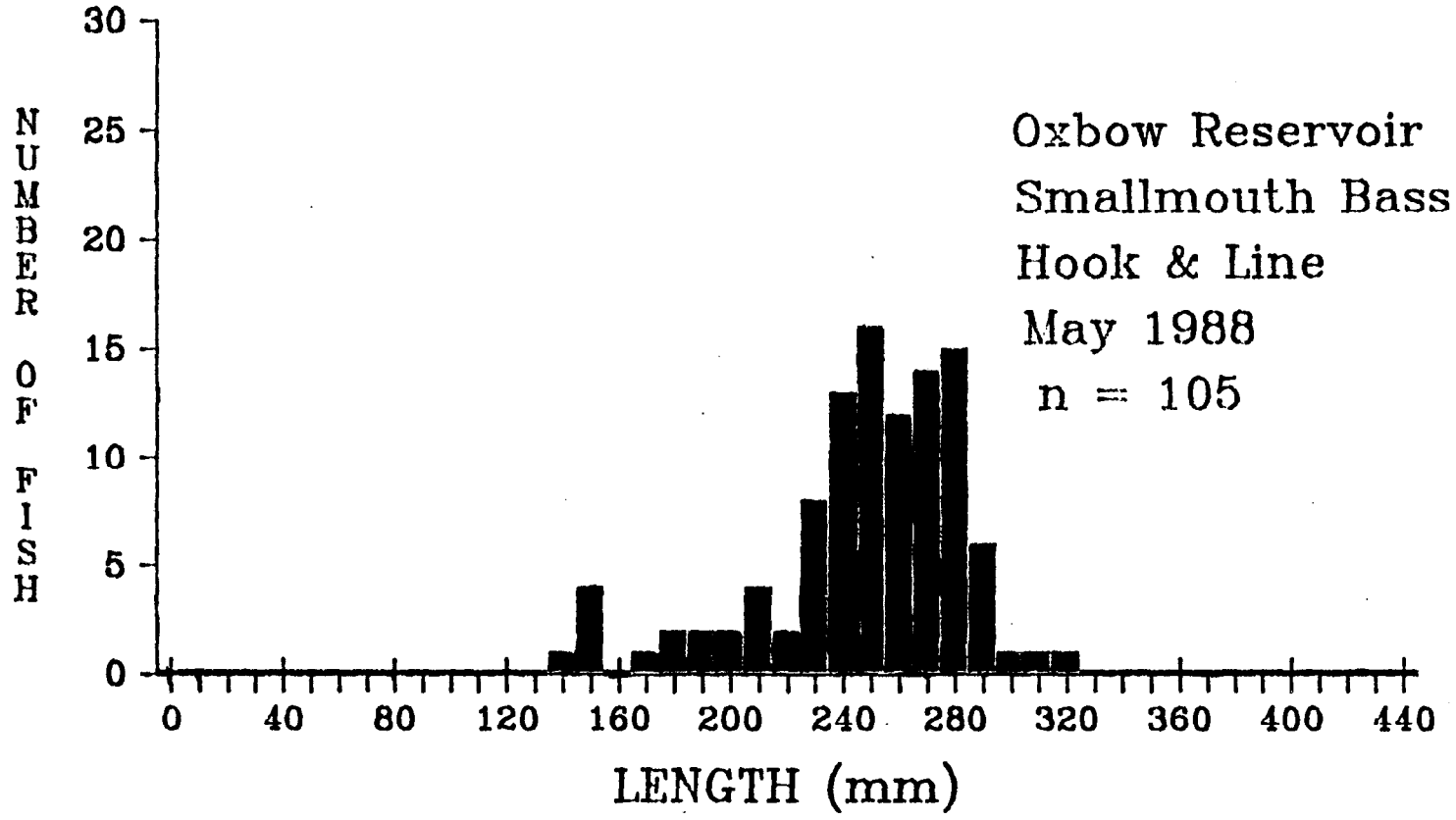


Figure 3. Length-frequency diagram of a sample of smallmouth bass collected by hook-and-line gear from Oxbow Reservoir, May 1988.

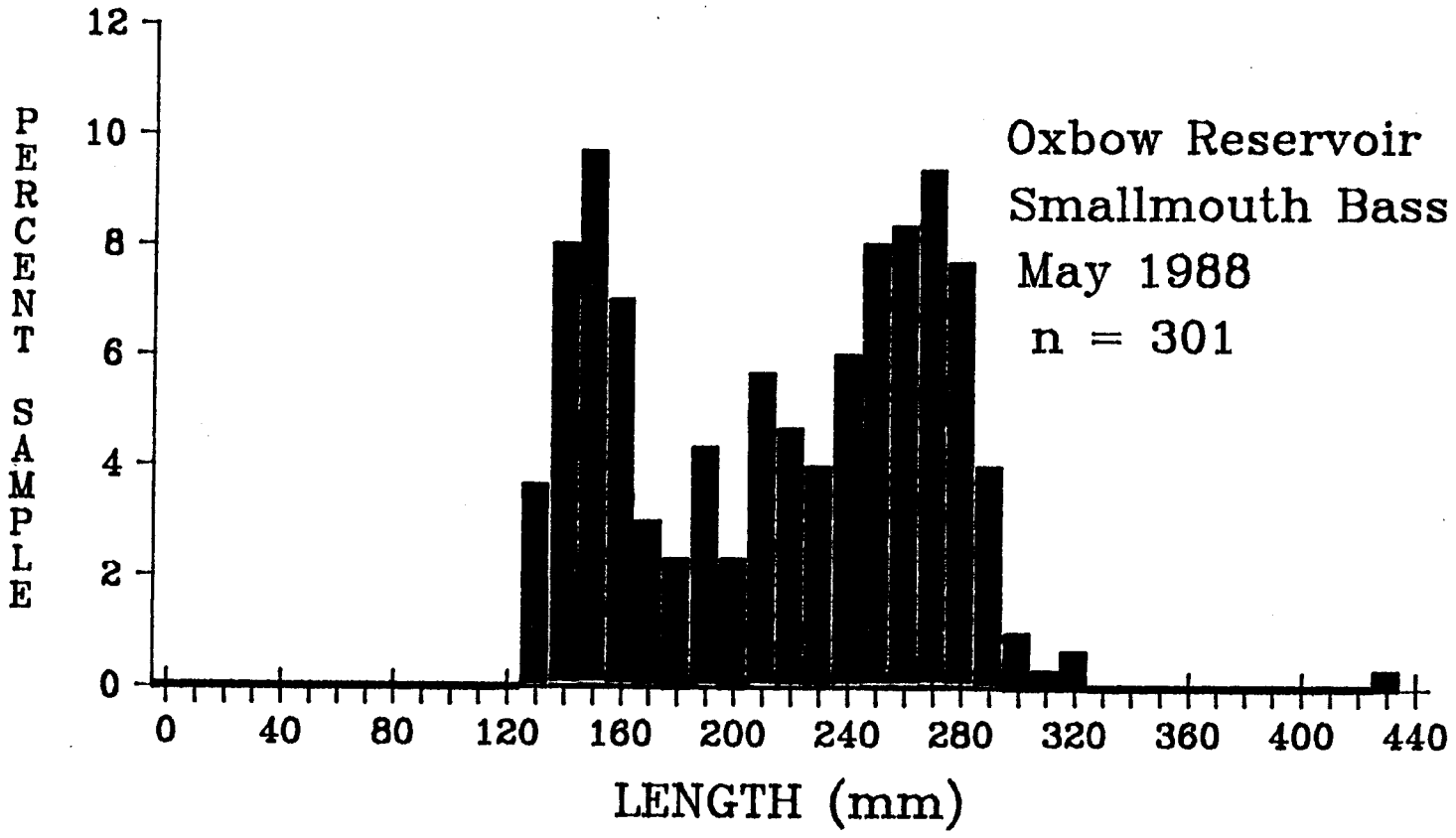


Figure 4. Length-frequency diagram of a combined sample of smallmouth bass collected by electrofishing and hook-and-line gear from Oxbow Reservoir, May 1988.

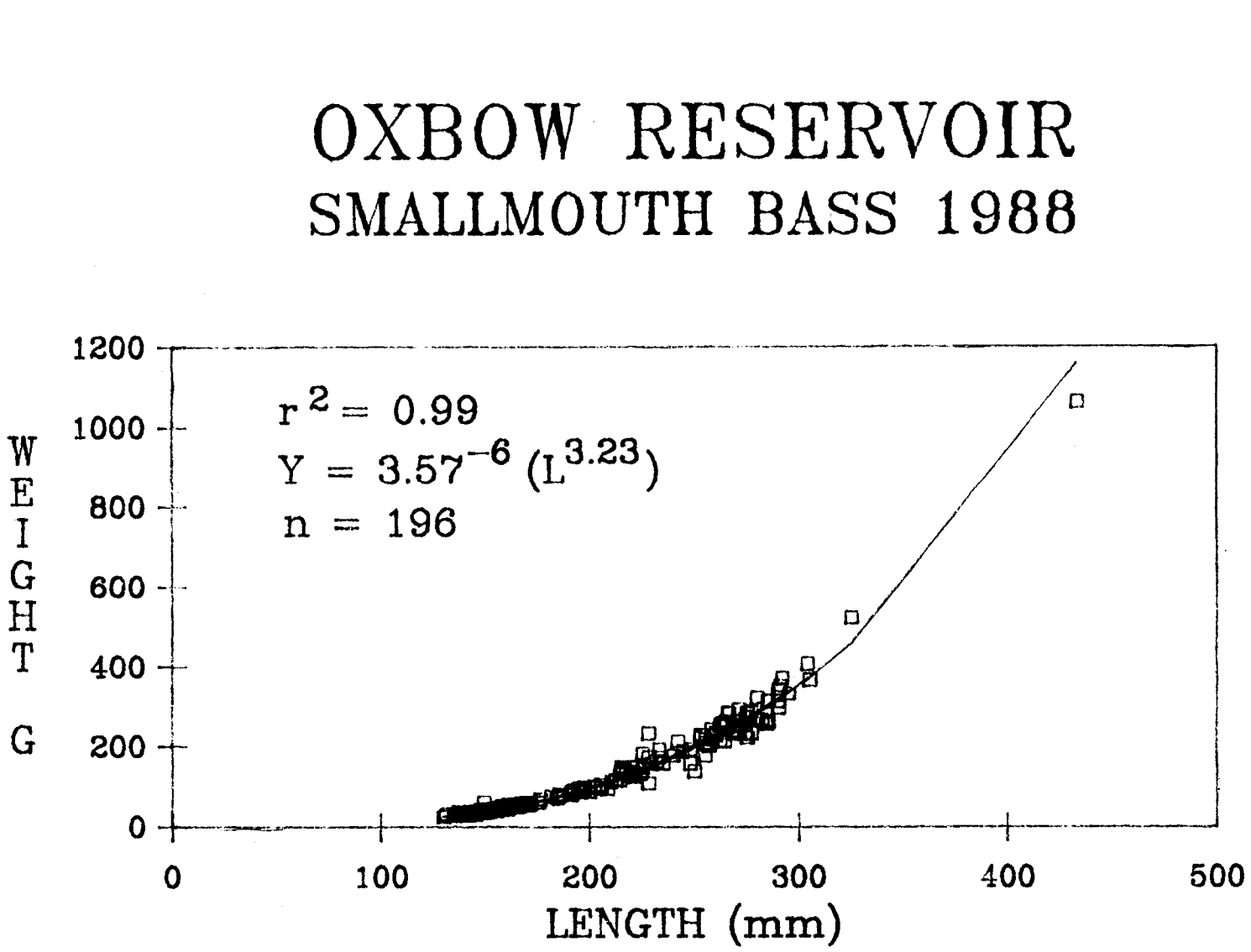


Figure 5. Length-weight relationship of smallmouth bass from Oxbow Reservoir collected by electrofishing gear in May 1988.

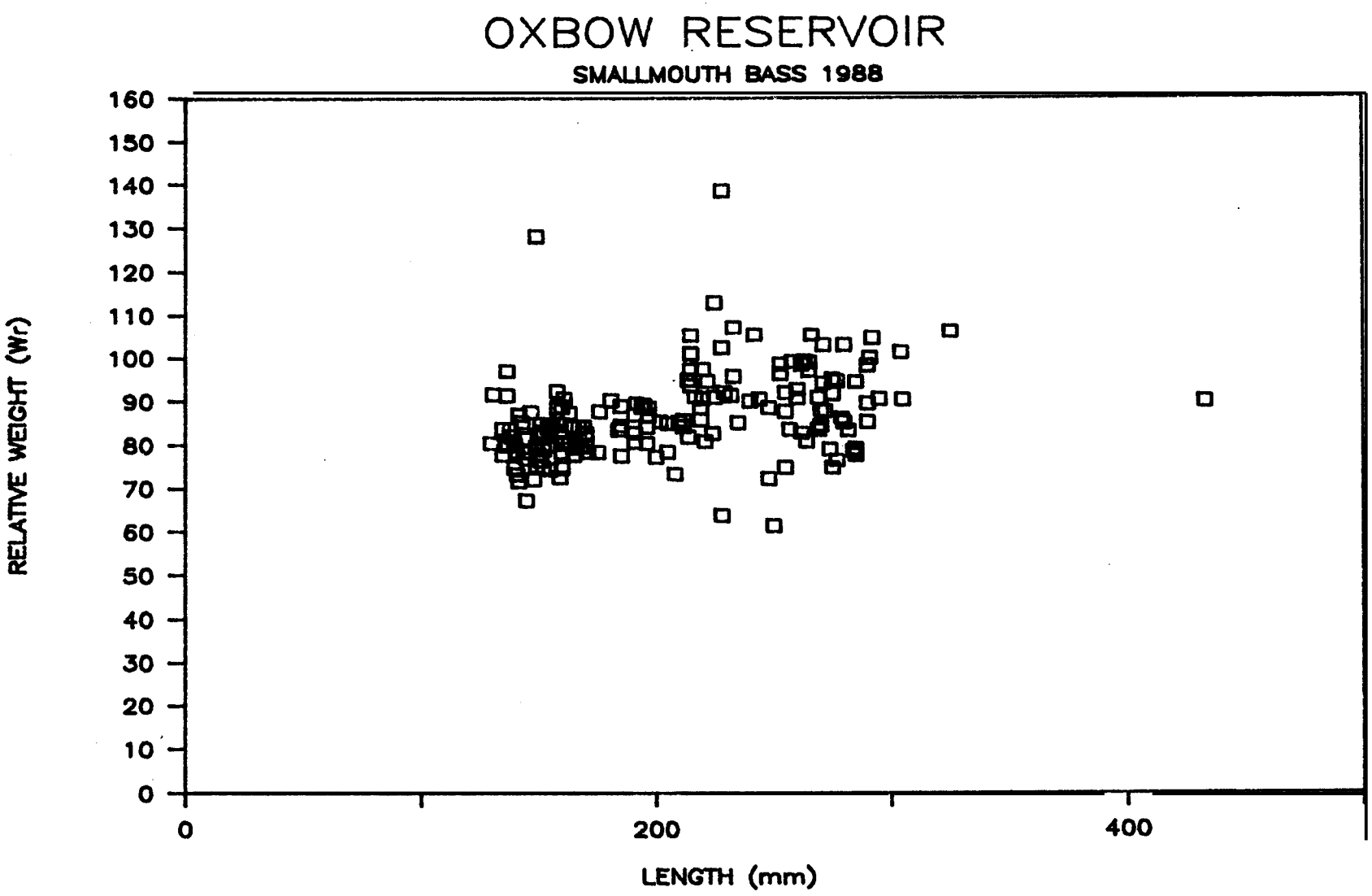


Figure 6. Scatter diagram of relative weights ($W_r$) for smallmouth bass from Oxbow Reservoir collected with electrofishing gear, May 1988. Sample size (n) equals 196.

Table 6. Mean relative weight ($W_r$) per 50 mm length group for smallmouth bass sampled by electrofishing in Oxbow Reservoir, May 24-25, 1988.

| Length Group (mm) | Number | Mean relative weight ($W_r$) |
|---|---|---|
| 101-150 | 37 | 82 |
| 151-200 | 68 | 83 |
| 201-250 | 39 | 91 |
| 251-300 | 48 | 90 |
| 301-350 | 3 | 99 |
| 351-400 | 0 | -- |
| 401-450 | 1 | 90 |

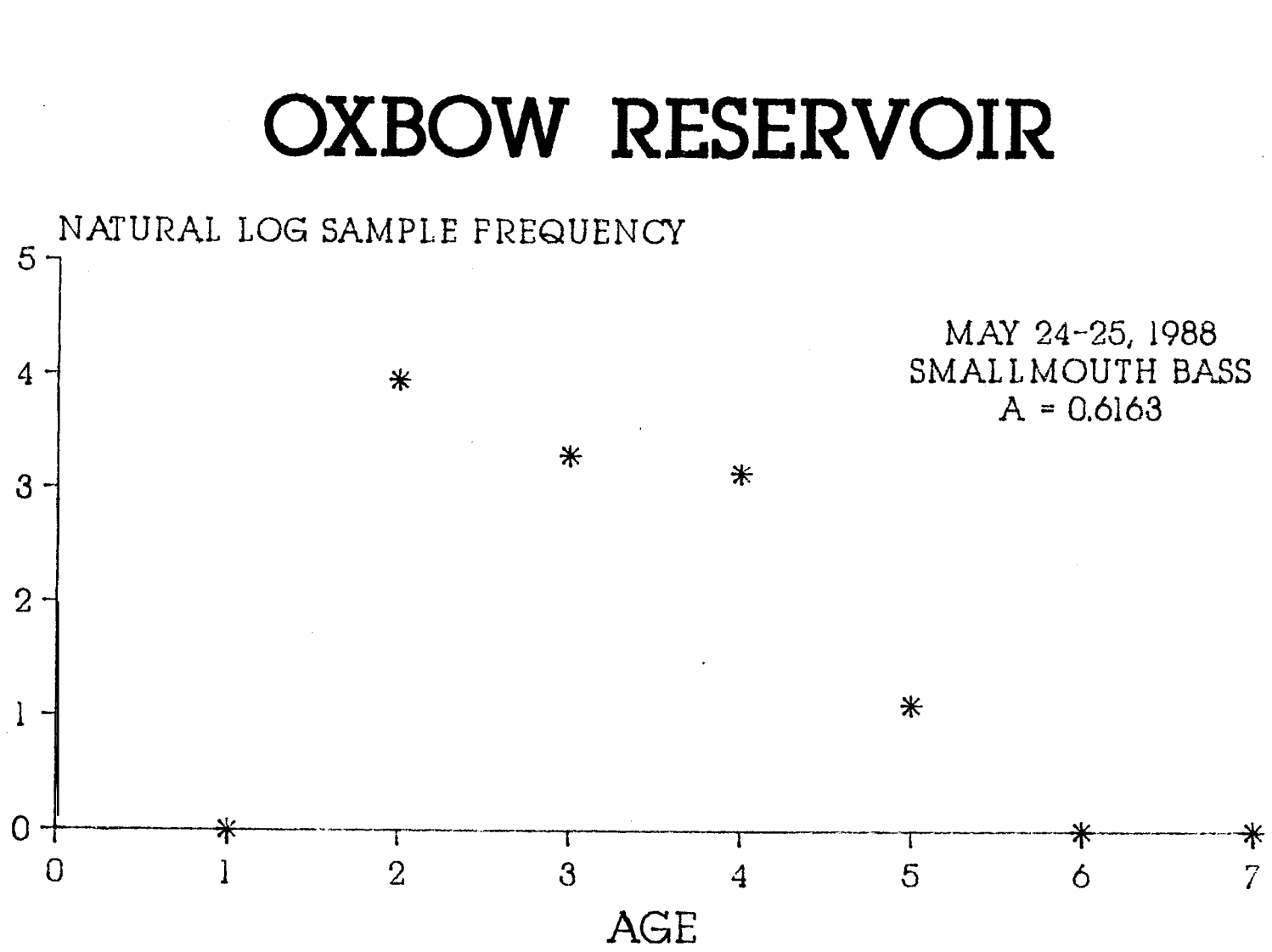


Figure 7. Catch curve for smallmouth bass from Oxbow Reservoir generated from electrofishing data, May 1988.

Table 7. Back-calculated lengths at age (mm) for a sample of smallmouth bass collected by electrofishing and rod and reel in Hells Canyon Reservoir, May 24-25, 1988. The correction factor (a) used in the analysis was 35 mm. Standard deviations are shown in parentheses.

| Age class | Year class | Number of fish | Mean length at capture (mm) | Mean length at annulus (mm) 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| I | 1987 | 2 | 72 | 69 (4.7) | | | | | | | |
| II | 1986 | 30 | 149 | 77 (7.3) | 145 (8.7) | | | | | | |
| III | 1985 | 72 | 207 | 78 (6.2) | 148 (12.6) | 202 (12.4) | | | | | |
| IV | 1984 | 58 | 265 | 73 (6.1) | 147 (15.6) | 220 (20.9) | 259 (21.8) | | | | |
| V | 1983 | 12 | 298 | 70 (6.0) | 137 (20.0) | 206 (27.2) | 263 (24.7) | 292 (25.8) | | | |
| VI | 1982 | 4 | 324 | 70 (9.3) | 126 (10.8) | 190 (7.6) | 253 (4.3) | 295 (7.4) | 319 (5.2) | | |
| VII | 1981 | 1 | 353 | 63 | 110 | 174 | 243 | 293 | 321 | 349 | |
| VIII | 1980 | 1 | 380 | 78 | 123 | 183 | 244 | 320 | 351 | 368 | 376 |
| Number of fish | | 180 | | 180 | 178 | 148 | 76 | 18 | 6 | 2 | 1 |
| Weighted mean length | | | | 75 | 146 | 209 | 259 | 294 | 325 | 359 | 376 |
| Increment of growth | | | | 75 | 71 | 63 | 50 | 35 | 31 | 34 | 17 |

Smallmouth bass sampled by electrofishing gear at Hells Canyon Reservoir in late May 1988 averaged 187 mm long and ranged from 67 mm to 375 mm (Figure 8), while bass sampled with hook-and-line averaged 219 mm long and ranged from 204 mm to 335 mm (Figure 9). Bass from the combined samples averaged 237 mm (Figure 10).

The PSD index for the May electrofishing sample of smallmouth bass was 22% with an RSD-350 index of 2% for the same sample. The PSD index for the hook-and-line sample was 15% with an RSD-350 index of 0.0%.

The total length-weight relationship for smallmouth bass from Hells Canyon Reservoir derived from electrofishing samples is described by the equation Y = 6.29'6 $_{(L}$ 3.12) (Figure 11).

Relative weights calculated for individual smallmouth bass from the electrofishing sample were grouped below the optimum Wr of 100 (Figure 12). Mean $W_r$ for bass per 50 mm length group ranged between 82 to 103, with a weighted mean $W_r$ of 87 (Table 8).

Total annual mortality for smallmouth bass ages 3-8 was estimated as 0.584 (Figure 13).

## Upper Payette Lake

Anglers expended nearly 16,000 hours of effort at Upper Payette Lake during the June through September 1988 period. Total effort was two and three times greater, respectively, than estimated use reported for 1971 and 1972 (Table 1). About 70% of the total effort occurred during the months of July and August (Table 9). Bank anglers comprised 55% of the effort, while boat and tube anglers made up 39% and 6%, respectively (Table 10).

An overall catch rate of 0.70 trout/hour was achieved with tube anglers having the highest success with a catch rate of 1.02 trout/hour (Table 10). Although bank anglers expended the most effort, overall they enjoyed the least success.

Total trout catch (harvest and release) exceeded 12,000 fish (Table 11). By comparison, catches in 1971 and 1972 were 5,141 and 6,363, respectively. Hatchery rainbow trout comprised 97% of total catch in 1988, with wild/natural rainbow trout, brook trout, and bull trout making up the remaining 3% (Table 11). Nearly 71% of the total catch occurred during July and August, directly corresponding with the highest periods of effort.

Hatchery rainbow trout averaged 258 mm long in the catch (Table 12). Wild/natural rainbow trout, brook trout, and bull trout averaged 260 mm, 270 mm, and 180 mm long, respectively. The greatest proportion of trout observed in the creel (52%) took place in August.

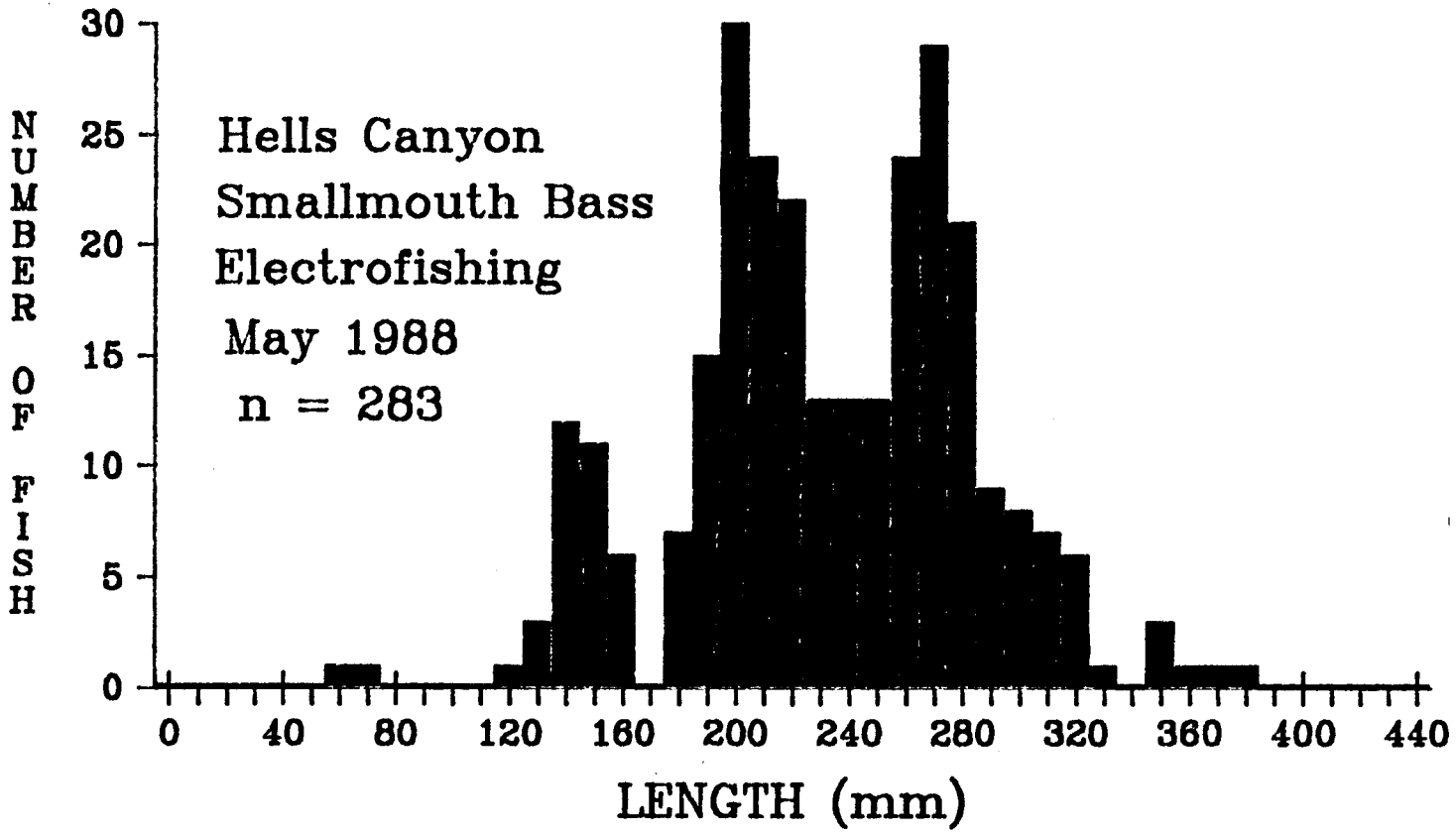


Figure 8. Length-frequency diagram of a sample of smallmouth bass collected by electrofishing gear from Hells Canyon Reservoir, May 1988.

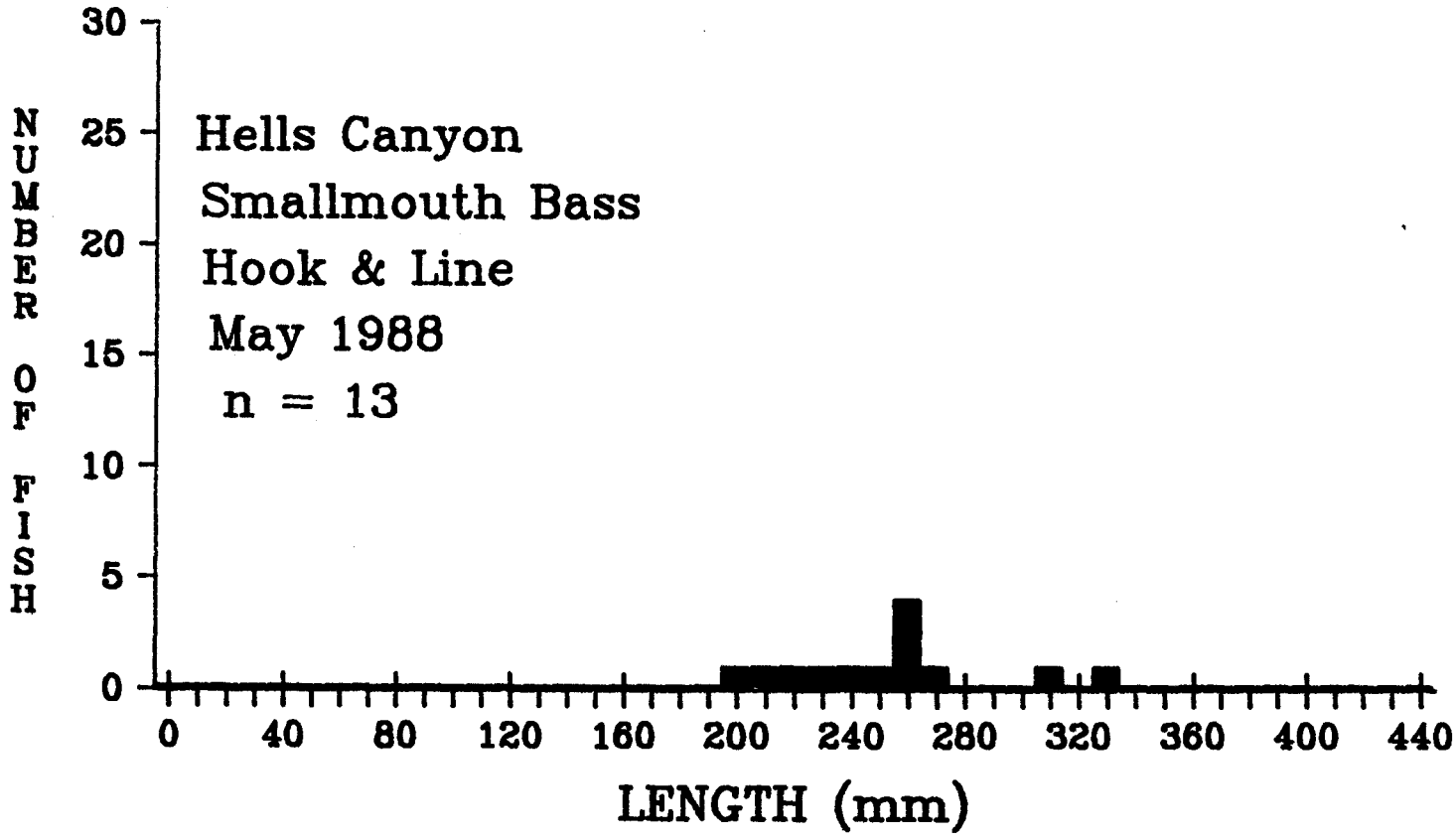


Figure 9. Length-frequency diagram of a sample of smallmouth bass collected by hook-and-line gear from Hells Canyon Reservoir, May 1988.

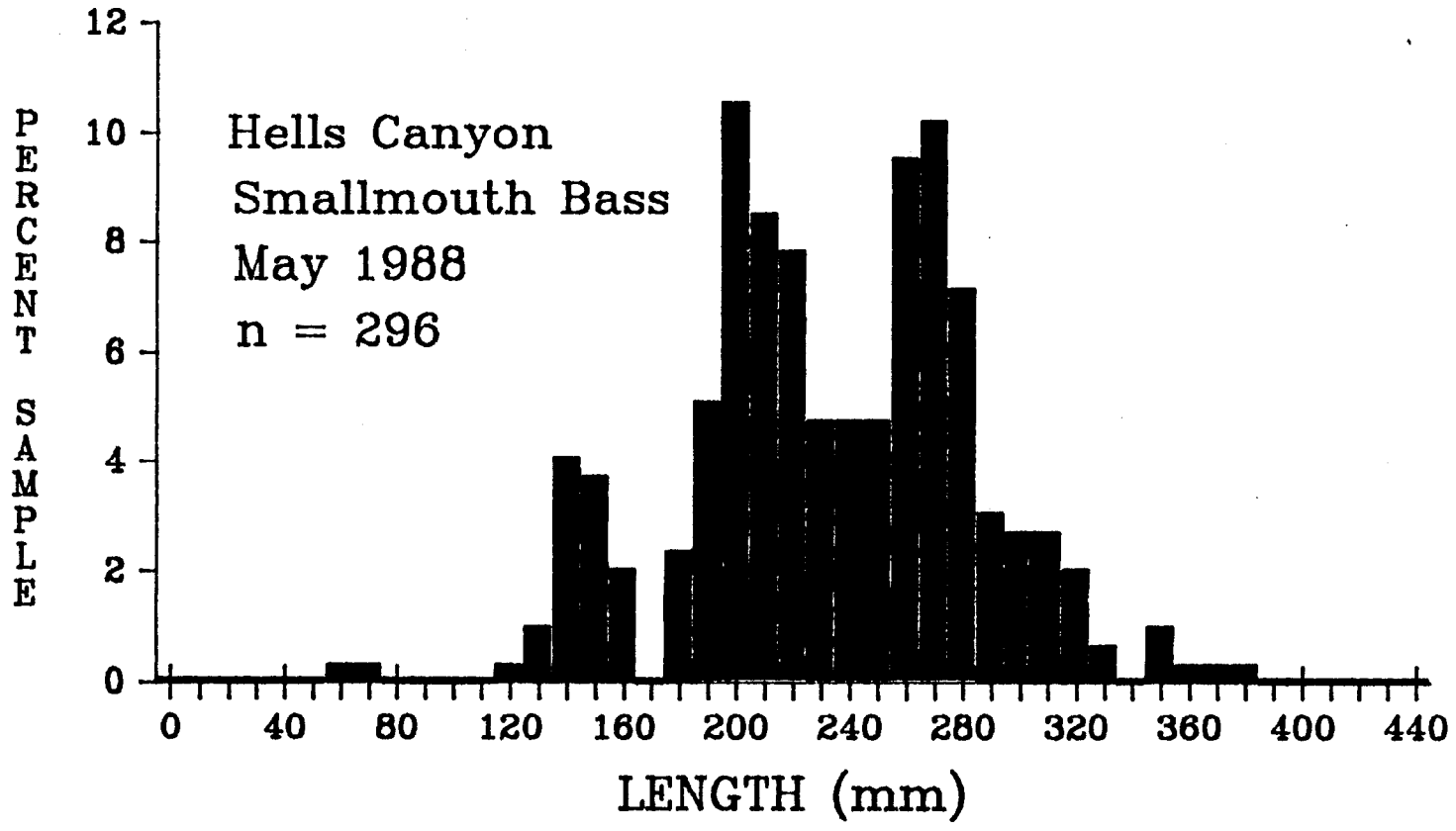


Figure 10. Length-frequency diagram of a combined sample of smallmouth bass collected by electrofishing and hook-and-line gear from Hells Canyon Reservoir, May 1988.

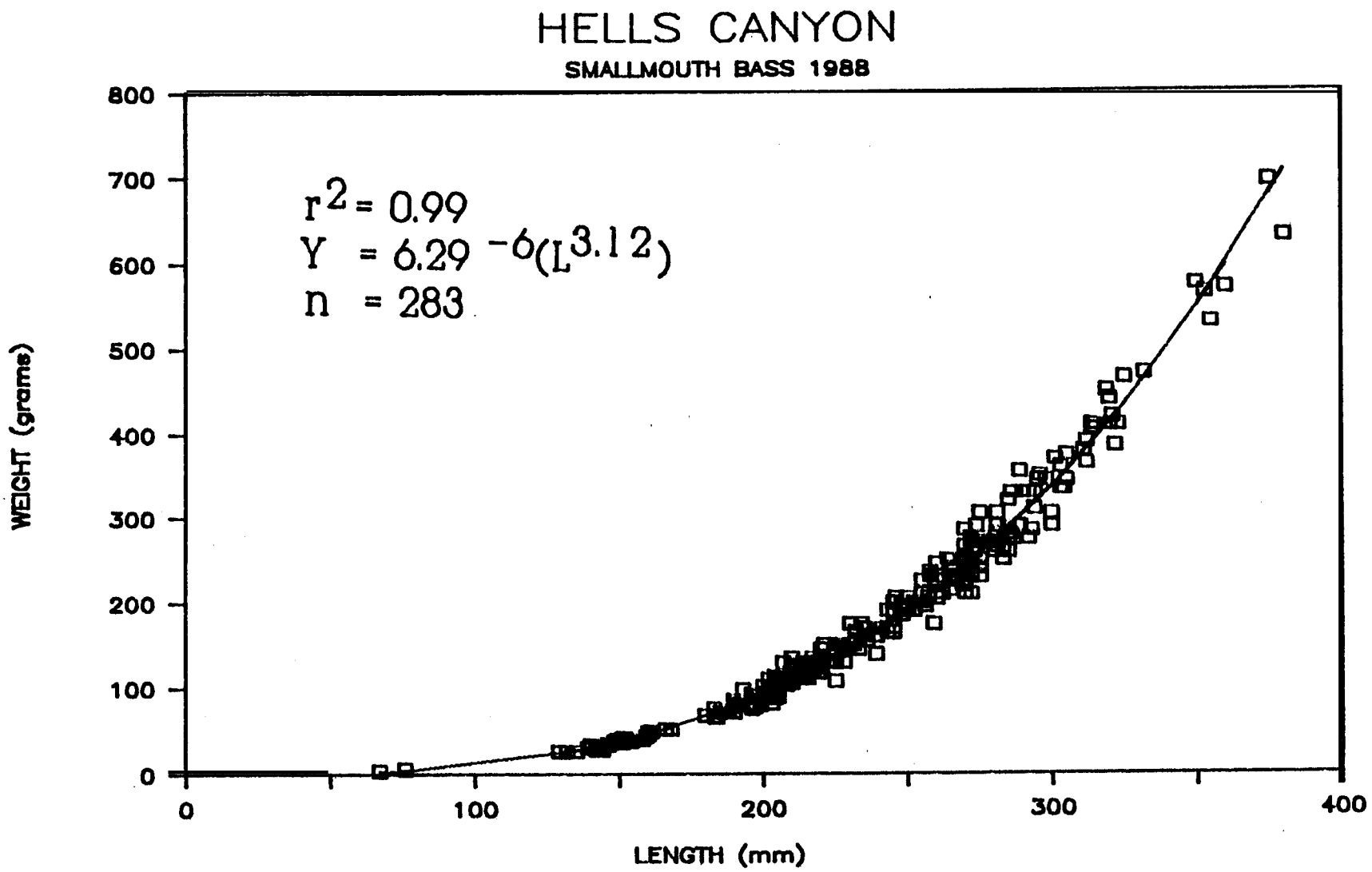


Figure 11. Length-weight relationship of smallmouth bass from Hells Canyon Reservoir collected by electrofishing gear, May 1988.

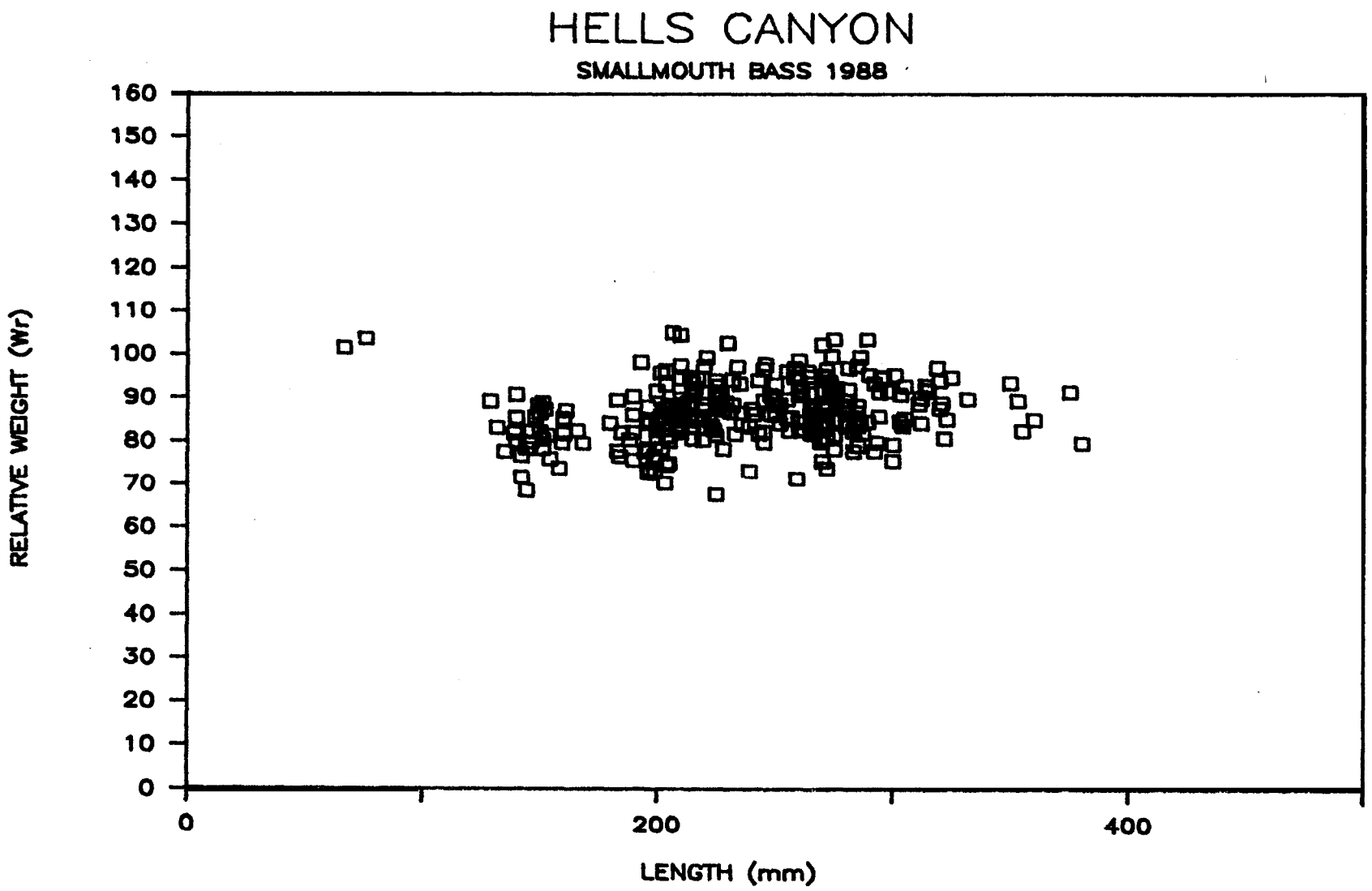


Figure 12. Scatter diagram of relative weights ($W_r$) for smallmouth bass from Hells Canyon Reservoir collected with electrofishing gear, May 1988. Sample size (n) equals 283.

Table 8. Mean relative weight ($W_r$) per 50 mm length group for smallmouth bass sampled by electrofishing in Hells Canyon Reservoir, May 24-25, 1988.

| Length Group (mm) | Number | Mean relative weight (Wr) |
|---|---|---|
| 51-100 | 2 | 103 |
| 101-150 | 19 | 82 |
| 151-200 | 44 | 82 |
| 201-250 | 97 | 88 |
| 251-300 | 95 | 88 |
| 301-350 | 21 | 90 |
| 351-400 | 5 | 86 |

DJ88T2

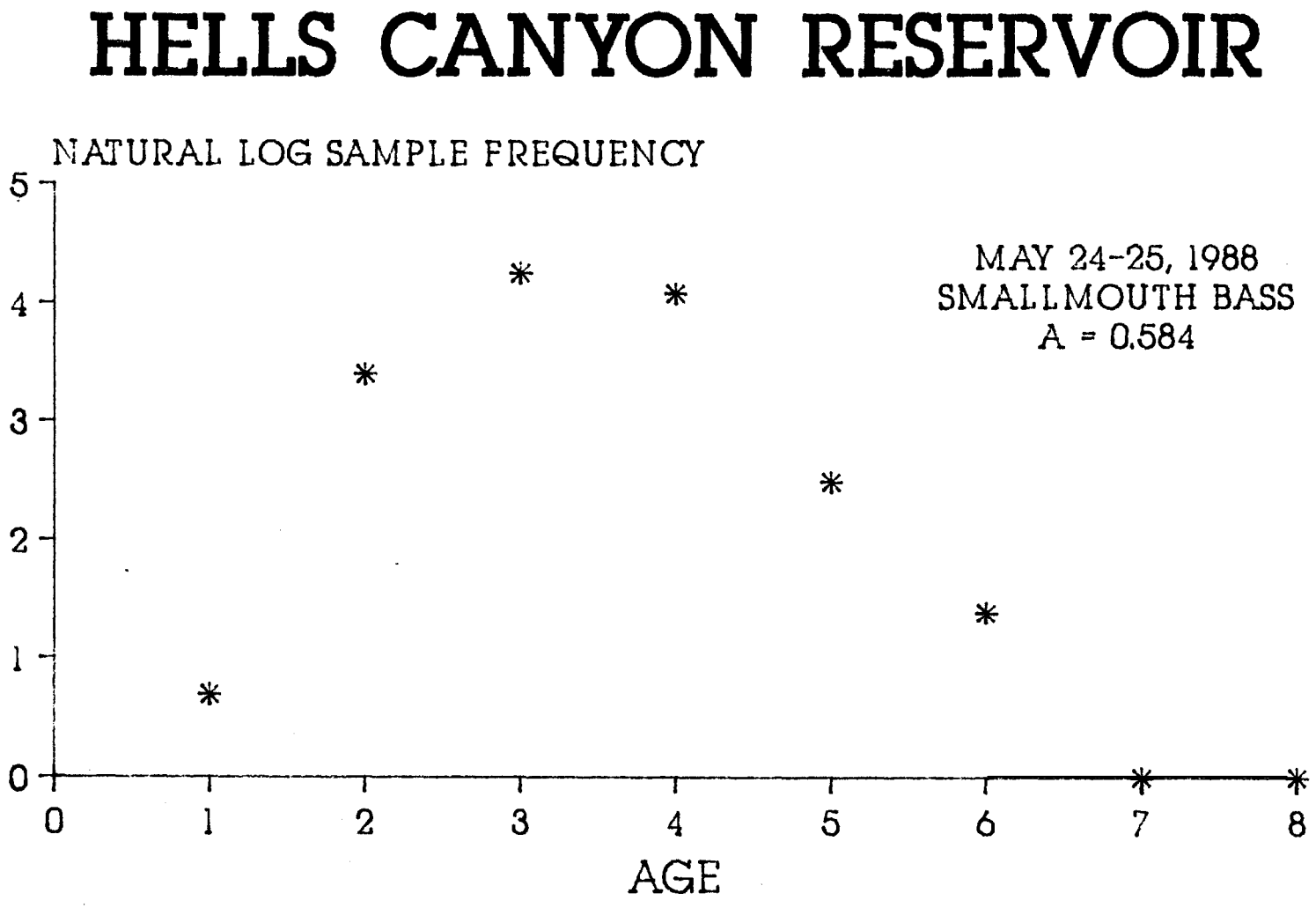


Figure 13. Catch curve for smallmouth bass from Hells Canyon Reservoir generated from electrofishing data, May 1988.

Table 9. Monthly statistics of fishing effort, catch rate, and catch with corresponding coefficient of variation (CV) derived from creel survey conducted at Upper Payette Lake, Idaho, from June through September, 1988.

| Month | Days surveyed WE | Days surveyed WD | Effort (hours) +CV | Catch rate (fish/hr) ± CV | Catch (number) ± CV |
|---|---|---|---|---|---|
| June | 3 | 3 | 2,676±33% | 0.61±62% | 1,908±60% |
| July | 3 | 3 | 5,583±41% | 0.66±35% | 3,364±40% |
| August | 3 | 3 | 5,534±46% | 0.84±30% | 5,214±77% |
| September | 3 | 3 | 2,010±55% | 0.54±57% | 1,641±69% |
| Totals | 12 | 12 | 15,803 | | 12,127 |
| Mean[a] | | | | 0.70 (n = 4) | |

[a]weighted by monthly effort

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Table 10. Monthly statistics of fishing effort, catch rate, and catch for boat, bank, and tube anglers derived from creel survey conducted at Upper Payette Lake, June through September, 1988. Percent of effort expended and catch by angler type is in parentheses.

| Month | Effort (hours) | | Catch rate (fish/hour) | Catch (number) | |
|---|---|---|---|---|---|
| June | | | | | |
| Boat | 327 | (12) | 0.07 | 234 | (12) |
| Bank | 2,349 | (88) | 0.61 | 1,674 | (88) |
| Tube | 0 | | -- | -- | |
| July | | | | | |
| Boat | 2,275 | (41) | 1.04 | 1,829 | (54) |
| Bank | 3,007 | (54) | 0.41 | 1,333 | (40) |
| Tube | 301 | ( 5) | 0.43 | 202 | ( 6) |
| August | | | | | |
| Boat | 2,940 | (53) | 0.88 | 2,945 | **(56)** |
| Bank | 2,013 | (36) | 0.50 | 1,339 | (26) |
| Tube | 581 | (11) | 1.60 | 930 | (18) |
| September | | | | | |
| Boat | 573 | (29) | 0.29 | 471 | (29) |
| Bank | 1,287 | (64) | 0.56 | 1,170 | (71) |
| Tube | 150 | ( 7) | 0 | 0 | |
| Totals | | | | | |
| Boat | 6,115 | (39) | X=0.83[a] | 5,479 | (45) |
| Bank | 8,656 | (55) | X=0.51[a] | 5,516 | (45) |
| Tube | 1,032 | ( 6) | X=1.02[a] | 1,131 | (10) |

[a]weighted by monthly effort.

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Table 11. Monthly estimates of catch (numbers) per fish species for boat and bank anglers at Upper Payette Lake from June through September, 1988. Estimates based on proportions observed during angler interviews per month.

| | Number per species | | | | |
|---|---|---|---|---|---|
| Length | Hatchery rainbow | Wild rainbow | Brook trout | Bull trout | Subtotal |
| June | | | | | |
| Boat | 611 | 0 | 0 | 0 | 611 |
| Bank | 1,221 | 0 | 76 | 0 | 1,297 |
| Tube | 0 | 0 | 0 | 0 | 0 |
| July | | | | | |
| Boat | 1,715 | 0 | 0 | 0 | 1,715 |
| Bank | 1,480 | 34 | 101 | 0 | 1,615 |
| Tube | 0 | 34 | 0 | 0 | 34 |
| August | | | | | |
| Boat | 2,451 | 0 | 0 | 0 | 2,451 |
| Bank | 2,033 | 52 | 0 | 0 | 2,085 |
| Tube | 678 | 0 | 0 | 0 | 678 |
| September | | | | | |
| Boat | 394 | 0 | 0 | 0 | 394 |
| Bank | 1,214 | 0 | 0 | 33 | 1,247 |
| Tube | 0 | 0 | 0 | 0 | 0 |
| Total | | | | | |
| Boat | 5,171 | 0 | 0 | 0 | 5,171 |
| Bank | 5,948 | 86 | 177 | 33 | 6,244 |
| Tube | 678 | 34 | 0 | 0 | 712 |
| Grand Totals | 11,797 | 120 | 177 | 33 | 12,127 |

DJ88T2

Table 12. Length statistics by month for game fish species appearing in the creel at Upper Payette Lake, June through September 1988. Sample size equals n and mean total length (mm) plus or minus standard deviation (mm) appears as XTL+SD.

| | Species of fish | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Hatchery rainbow | | Wild rainbow | | Brook trout | | Bull trout | |
| Month | n | XTL+SD | n | XTL+SD | n | XTL+SD | n | XTL+SD |
| June | 24 | 254±18 | | | 1 | 320 | | -- |
| July | 12 | 254±10 | 2 | 290±14 | | -- | | -- |
| August | 84 | 255±22 | 1 | 200 | 1 | 220 | | -- |
| September | 43 | 267±24 | | -- | | -- | 1 | 180 |
| Means | 163 | 258 | 3 | 260 | 2 | 270 | 1 | 180 |

[a]weighted by monthly averages

Hatchery rainbow trout, on average, comprised 100%, 95Z, and 25%, respectively, of the catch for boat, bank, and tube anglers (Table 13) during June through September. Based on creel survey estimates, approximately 59% of the catchable rainbow trout were caught by anglers. The strain of rainbow trout stocked was Mt. Lassen.

A total of 114 fish representing six species were captured in four gill nets set in Upper Payette Lake in early June 1988. Mountain whitefish comprised 63% (n=72) of the total sample, while nongame fish made up 30% (n=35) and were represented by redside shiners and unidentified dace and sucker species. Additionally, six brook trout and one wild/natural appearing rainbow trout were collected.

Subsamples of the total catch revealed mean total lengths of 190 mm for whitefish and 273 mm for brook trout, while the single rainbow trout was 130 mm. The lone rainbow trout may have been an Eagle Lake fingerling from an 1987 stocking of 100,000 fish.

## DISCUSSION

### Horsetheif Reservoir

Although angling at Horsethief Reservoir was relatively slow over the 1988 Memorial Day weekend, it is uncertain whether the decline was directly attributable to the expanded fishing season, especially considering the weather-shortened sample. However, conservation officers reported excellent catches of rainbow trout prior to Memorial day in April and May. Also, the average size of harvested trout in 1988 was about 20 mm less than reported in 1987, suggesting an accelerated harvest of larger holdovers from 1987 plants with the early fishing. Overall, it appears the regulation change resulted in reduced catch rates, pressure, and fish size on one weekend of historically excellent fishing in exchange for six additional weeks of very consistent fishing.

Horsethief Reservoir occasionally receives annual plants of domestic subcatchable Kamloops rainbow trout and fingerling Henrys Lake cutthroat trout or rainbow X cutthroat trout hybrids. Kamloops trout are generally planted in early June and have been the mainstay of the fishery, typically contributing well over 90% of the traditional opening weekend catch. Cutthroat trout and hybrids are stocked as fingerlings in mid-September, and add little to the fishery.

Stocking cutthroat and hybrids at 76 mm in late summer probably decreases overall survival through the winter versus stocking at 127 mm to 52 mm (M. Larkin, IDFG, personal communication). If stockings of cutthroat and hybrid trout continue at Horsethief Reservoir, a larger size fish needs to be planted in late summer, or planting should be delayed until spring using the previous years fish. Hybrid trout of 127 mm long could be produced from early egg takes (February-March) at Henrys Lake Hatchery (B. George, IDFG, personal communication). If stocking were

Table 13. Percent species composition of catch for boat, bank, and tube anglers at Upper Payette Lake from June through September 1988.

| Month | Species of Fish | | | |
|---|---|---|---|---|
| | Hatchery rainbow | Wild rainbow | Brook trout | Bull trout |
| June | | | | |
| Boat | 100 | 0 | 0 | 0 |
| Bank | 94 | 0 | 6 | 0 |
| Tube | 0 | 0 | 0 | 0 |
| July | | | | |
| Boat | 100 | 0 | 0 | 0 |
| Bank | 92 | 2 | 6 | 0 |
| Tube | 0 | 100 | 0 | 0 |
| August | | | | |
| Boat | 100 | 0 | 0 | 0 |
| Bank | 98 | 2 | 0 | 0 |
| Tube | 100 | 0 | 0 | 0 |
| September | | | | |
| Boat | 100 | 0 | 0 | 0 |
| Bank | 97 | 0 | 0 | 3 |
| Tube | 0 | 0 | 0 | 0 |
| Means | | | | |
| Boat | 100 | 0 | 0 | 0 |
| Bank | 95 | 1 | 5 | <1 |
| Tube | 25 | 25 | 0 | 0 |

delayed until spring, approximately a 229 mm to 254 mm fish would be available. Based on past records, however, it may be desirable to phase out these plants and focus on better alternatives.

Because large (400+ mm) holdover Kamloops trout appear more vulnerable to angling following ice-off in early April through the traditional opener, the quality facet of the fishery was conspicuously absent on Memorial Day and thereafter. The early to mid-summer fishery was supported by the June 1987 fingerling plant (254 mm to 305 mm) and the late summer fishery included many 1988 fingerlings (178 mm to 254 mm). Therefore, a change in stocking strategy was proposed for 1989.

To fill the void created by increased early harvest of holdover Kamloops trout, a late summer plant of subcatchable Kamloops was proposed. However, subcatchable Kamloops were stocked in early summer 1988. A group of brown trout being reared at Nampa Hatchery, scheduled for the North Fork Payette River, was also diverted to Horsethief Reservoir to supply a large fish component in 1989. A total of 4,140 brown trout of subcatchable size were stocked on October 26, 1988.

## Little Payette Lake

The Little Payette Lake fishery was consistently the premier trout water for anglers in 1988 in the McCall subregion. The vast majority of angler comments and reports were of a positive nature, and the public was fully supportive of the Department's management scenario. Growth of trout in the lake was good, approximately 75 mm in less than four months for the Pennask strain. Trout of both the Kamloops and Pennask Lake strains sampled in late summer were in robust condition. However, the recent re-invasion of Little Payette Lake by nongame fish may preclude the continued development of the system as a trophy trout water.

Nongame fish species probably accessed Little Payette Lake via Lake Fork Creek through the low water outlet pipe when the lake was at minimum pool, and/or there were survivors from chemical rehabilitation. It is possible that following the cessation of irrigation withdrawal, insufficient hydraulic head existed in the pipe to create adequate velocities to deter fish movements. If this was the situation, the pipe needs redesigning to guarantee velocities great enough to halt continued reinvasion, or the current migration barrier needs improvement. Options appear limited, but available technology should exist to solve the problem.

Ideal habitat for smallmouth bass does not exist in Little Payette Lake. It can best be described as marginal in nature. The altitude (>1,525 m), relatively short growing season, and general lack of rocky shoal areas typically preferred by the species may not be conducive to survival and establishment of bass. Growth of smallmouth bass in Little Payette Lake undoubtedly would be relatively slow as compared to existing Idaho populations.

Smallmouth bass were stocked into Anderson Ranch Reservoir (elevation 1,280 m) by the IDFG in the early 1970s in hopes of controlling northern squawfish (Pollard 1973; Beach 1975). Since that time, a respectable two-story fishery composed of bass and salmonids has developed, with bass of nearly 2.7 kg being harvested. Although no cause and effect relationship has been established between the introduction of smallmouth bass and squawfish density, a decline in squawfish numbers has occurred since the introduction of bass (F. Partridge, IDFG, personal communication).

Realistically, the lifespan of the current trophy trout fishery in Little Payette Lake has been considerably shortened by the presence of nongame fish. A previous chemical treatment of Little Payette Lake with antimycin in 1971 and subsequent restocking with rainbow trout and kokanee resulted in superior fishing for several years afterwards (Welsh 1973). Size of trout two to three years after the 1971 rehabilitation was reported to be commonly between 400 mm to 450 mm. Fishing quality declined by the late 1970s with squawfish and suckers again dominating the system and out-competing game fish.

Engineering improvements should be made to eliminate movements of nongame fish into Little Payette Lake via Lake Fork Creek. Attention should be focused on the current barrier and the low water outlet pipe. Once these items are rectified, future rehabilitation should occur when biologically warranted.

## Lost Valley Reservoir

Because of two consecutive drought years in Idaho, Lost Valley Reservoir was essentially drawn down to near minimum capacity by late summer 1988. With the potential of a winterkill, salvage limits were adopted by the Fish and Game Commission effective September 1, 1988, for a 120 day period. Working with the local irrigation district, the IDFG requested a minimal pool of water be left in the reservoir to avoid a fishkill, and that the district allow the impoundment to fill rapidly. The trout fishery needs rebuilding to sustain the typical levels of harvest. Catchable trout probably are needed initially after ice-off to satisfy anglers.

Yellow perch are again present in Lost Valley Reservoir approximately three years after chemical treatment with rotenone. Although gill net samples suggested perch were in low abundance, their presence causes alarm because of the species' past tendency to stunt and overpopulate the impoundment. The fishery will be monitored closely during the next few years. Should yellow perch become established to the point of impacting trout growth and survival, the system will be chemically rehabilitated.

## Oxbow-Hells Canyon Reservoir Complex

Smallmouth bass populations present in the Oxbow-Hells Canyon reservoir complex exhibit slow, albeit average growth rates for Idaho stocks. Snake River smallmouth bass appear to grow at a surprisingly comparable rate regardless of location or habitat type in the system. Responses of discrete bass populations to restrictive regulations within the Snake River reservoir complex and free-flowing reaches arguably is a relatively slow process, and discernible changes may not appear for years following institution of the 1985 regulations.

The degree of exploitation on these populations directly affects stock structure, primarily leading to a general depletion of larger size classes. Angling mortality was demonstrated to be a major factor negatively affecting bass stock structure and, consequently, fishing quality in Brownlee Reservoir (Rohrer 1984). Rohrer estimated an exploitation rate of 44% on bass in the 1983 Brownlee Reservoir fishery. Fishing pressure exerted on Brownlee Reservoir appears to far exceed that observed at other Lower Snake River fisheries (B. Mabbott, IDFG, personal communication), so positive benefits of restrictive regulations would probably surface at Brownlee in a more obvious fashion than in areas where exploitation is not a limiting variable.

The question arises whether current regulations are eliciting the expected responses in bass stocks that fishery personnel predicted, or should alternative regulations be considered. McCall fishery staff cannot provide realistic management options without exploitation estimates on bass from Oxbow and Hells Canyon reservoirs. Angling mortality is suspected to be considerably less than observed upriver at Brownlee Reservoir, but total mortalities are not that much less than the 73% estimated by Rohrer. A general paucity of larger bass exists in both downstream impoundments despite the suspected lower harvest.

Recommendations for the Oxbow-Hells Canyon bass fisheries need to be viewed in conjunction with management of Brownlee Reservoir. The three systems can either be managed as a reservoir complex with uniform bass regulations, or as separate units with the option to offer diverse fishing opportunities. Some future variables which need assessment at both Oxbow and Hells Canyon reservoirs are forage availability and suitability and exploitation rates on smallmouth bass in the respective fisheries.

## Upper Payette Lake

Angler use at Upper Payette Lake has increased significantly since the early 1970s, but subregional personnel believe the fishery has not reached full potential. Based on gill net samples, it appears most of the natural fish production within the system is currently tied up in stunted whitefish and nongame fish. Although nearly 60% of the catchable rainbow trout were caught by anglers in 1988, over-winter survival of catchables is thought to be insignificant, thus necessitating annual plants of 20,000 or more fish to sustain a fishery. Additionally, based on creel survey

results, fingerling rainbow trout stockings contribute little to the fishery. Competition for food and/or space with stunted fish populations may limit fingerling trout survival. Both Eagle Lake and McConnaughy strains have been stocked in Upper Payette Lake with little success.

The potential exists to manage Upper Payette Lake for something other than catchable rainbow trout. The current biological imbalance limits options, since most of the secondary production is bound in undesirable fish species. A put and take program is supporting a respectable trout fishery, but public sentiment is leaning towards either quality or specialty fish management. These options certainly exist, but most would require chemical rehabilitation of Upper Payette Lake.

The recent success with rehabilitating Little Payette Lake, and the subsequent high quality trout fishery which developed, serves as an example of a viable, achievable management project. The domestic Kamloops trout-Pennask Lake rainbow trout combination is providing the desired results. A similar scenario might work well in Upper Payette Lake. Some anglers have suggested specialty or high visibility fish species. If deemed feasible and/or compatible with the drainage, a certified disease-free source of fish would be needed since the McCall summer chinook salmon hatchery is located downstream below Payette Lake.

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JOB PERFORMANCE REPORT

State of: Idaho

Name: Regional Fishery Management Investigations

Project No.: F-71-R-13

Title: McCall Subregion Lowland Lakes and Reservoir Investigations-Payette Lake

Job No.: 3__(MC)-b[2]

Period Covered: July 1, 1988 to June 30, 1989


**ABSTRACT**

Anglers expended nearly 28,000 hours of effort at Payette Lake during May through October 1988. An overall catch rate of 0.27 fish/hr was observed. Total salmonid catch exceeded 4,800 fish, of which 41% was kokanee and 36% was catchable rainbow trout. Catchable rainbow trout returned to the creel at a rate of approximately 9%. Expanded lake trout catch and yield estimates were 0.15 fish/ha and 0.40 kg/ha, respectively. Estimated catch and yield for kokanee were 0.99 fish/ha and 0.23 kg/ha, respectively. Lake trout were exploited at a rate below 2% in the fishery.

A total of 90 lake trout were captured in gill nets set in Payette Lake from May through October 1988. Lake trout ranged in size from 29 cm to 96 cm and averaged nearly 73 cm long. Average weight of lake trout was 5.8 kg.

Macrozooplankton composition sampled in May, July, and August 1988 included Copepoda, Daphnia, Bosmina, Holopedium, Diaphanosoma, Leptodora, and Polyphemus. Copepods typically were the dominant zooplankter.

Estimated total kokanee abundance in Payette Lake in July and September 1988 was 187,000 fish and 119,000 fish, respectively. Total biomass estimates for the July and September samples were 475 kg and 800 kg, respectively, while estimated average kokanee densities for the same samples were 87 fish/ha and 55 fish/ha, respectively. Age 2+ and older fish were not sampled effectively with trawling gear. Estimated survival of the 1988 hatchery release was approximately 10%.



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## OBJECTIVES

To maintain information for fishery management activities and decisions for lowland lakes and reservoirs.

## RECOMMENDATIONS

1. Continue and refine annual monitoring programs at Payette Lake for kokanee and macrozooplankton abundance. Lake trout should be assessed periodically to document size structure, condition, and the extent of natural reproduction.

2. Document return to creel of catchable rainbow trout in Payette Lake by jaw tagging.

## INTRODUCTION

Payette Lake is a large (2,160 surface ha) dimictic body of water, which is in an early mesotrophic condition, and lies at a elevation of 1,524 m. Physical and chemical parameters of the system are fully described by the Environmental Protection Agency (197,7), Falter and Mitchell (1981), Falter (1984), and Scully and Anderson (1989). Limnological information has been reported by Rieman (1981) and Falter and Mitchell (1981).

Fish species currently inhabiting Payette Lake include rainbow trout Oncorhynchus mykiss, kokanee salmon O. nerka, cutthroat trout Oncorhynchus clarki, lake trout Salvelinus namaycush, mountain whitefish Prosopium williamsoni, yellow perch Perca flavescens, northern squawfish Ptychocheilus oregonensis, redside shiner Richardsonius balteatus, suckers Catostomus sp., dace Rhinichthys sp., and sculpin Cottus sp. Welsh (1985) and Scully and Anderson (1989) presented detailed histories of the Payette Lake fishery. A summary of historical fish stocking records is found in Appendices 4 and 5. A detailed study conducted by Bowler (1981) in 1980 assessed kokanee population status. Creel surveys were conducted at Payette Lake in 1971 and 1972 (Welsh 1972, 1973) and 1987 (Scully and Anderson 1989).

Mysis relicta were experimentally released into Payette Lake by Idaho Fish and Game personnel between 1967 and 1969. To date, none have been found following these introductions.

## METHODS

### Creel Survey

A roving creel survey was conducted via boat at Payette Lake from May through October, 1988, following procedures outlined by Anderson et al. (1987). Fishery statistics were compiled using methods suggested by Anderson et al. (1987).

## Gillnetting and Tagging

Variable mesh gill nets were set at various locations in Payette Lake during the period mid-May to mid-October 1988 for a total of 17 net nights (Figure 1). Nets were set at dusk in a horizontal fashion at depths ranging from 1.8 m to 30.5 m. Gill nets were checked hourly for captured lake trout. Lake trout collected were immediately placed in a large metal holding tank containing water chilled to about 10°C and oxygenated with a battery-powered agitator. Fish were allowed time to recover from gillnetting before handling. Individual lake trout were measured for total length and weight, and scale samples were collected for age and growth analysis. When possible, lake trout were marked with floy cinch-up tags immediately below the dorsal fin. Tags were individually numbered and offered a reward upon return to the IDFG. The number of tags returned by anglers was used to estimate an exploitation rate on lake trout.

A cursory examination was made of lake trout stomach contents from gill net mortalities.

## Mid-water Trawling-Kokanee Abundance

Kokanee were sampled in July and September with a mid-winter trawl towed by an 8.5 m boat powered by a 140 hp diesel engine. Methodology for conducting trawling was reported by Bowles et al. (1986, 1987).

A stratified systematic sampling scheme was used to estimate kokanee abundance and density. Payette Lake was divided into two sections or strata (Figure 2). A third area of the lake, known as the Narrows, was not sampled since the underwater topography seemed to prohibit effective trawling. A total of 11 transects were sampled in July and 12 transects in September (Figures 3 and 4), with one haul (sample) made along each transect.

Fishery statistics were calculated following methods summarized by Bowles et al. (1986, 1987).

## Limnological Sampling

The macrozooplankton community was sampled in five locations of Payette Lake selected to represent the various portions of the lake (Figure 14). Methodology used was summarized by Bowles et al. (1987).

Temperature profiles were collected at various locations of Payette Lake as were Secchi disc transparencies (Figure 14).

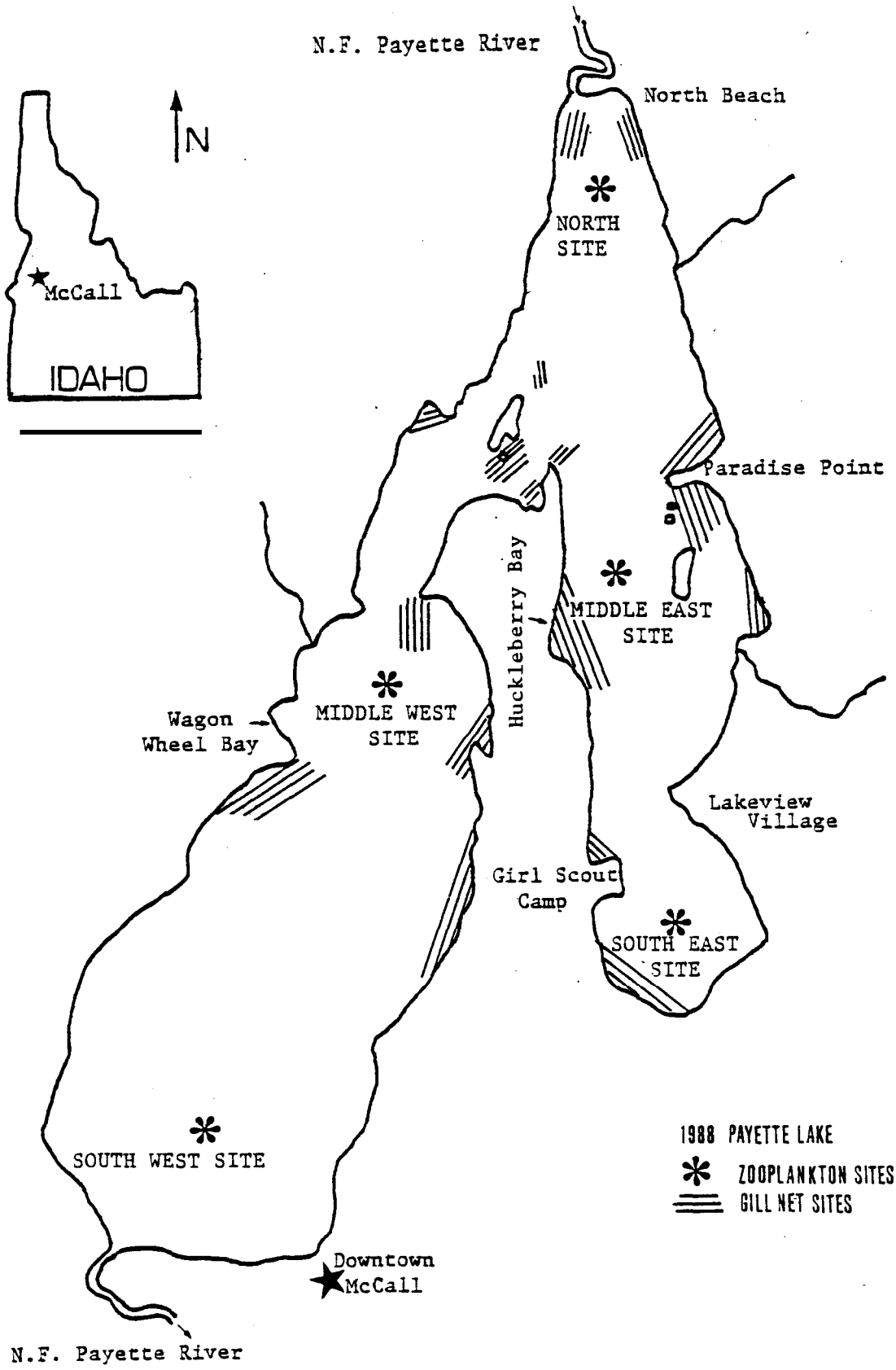


Figure 1. Map of Payette Lake denoting approximate sites of gillnetting and limnological sampling conducted in 1988.

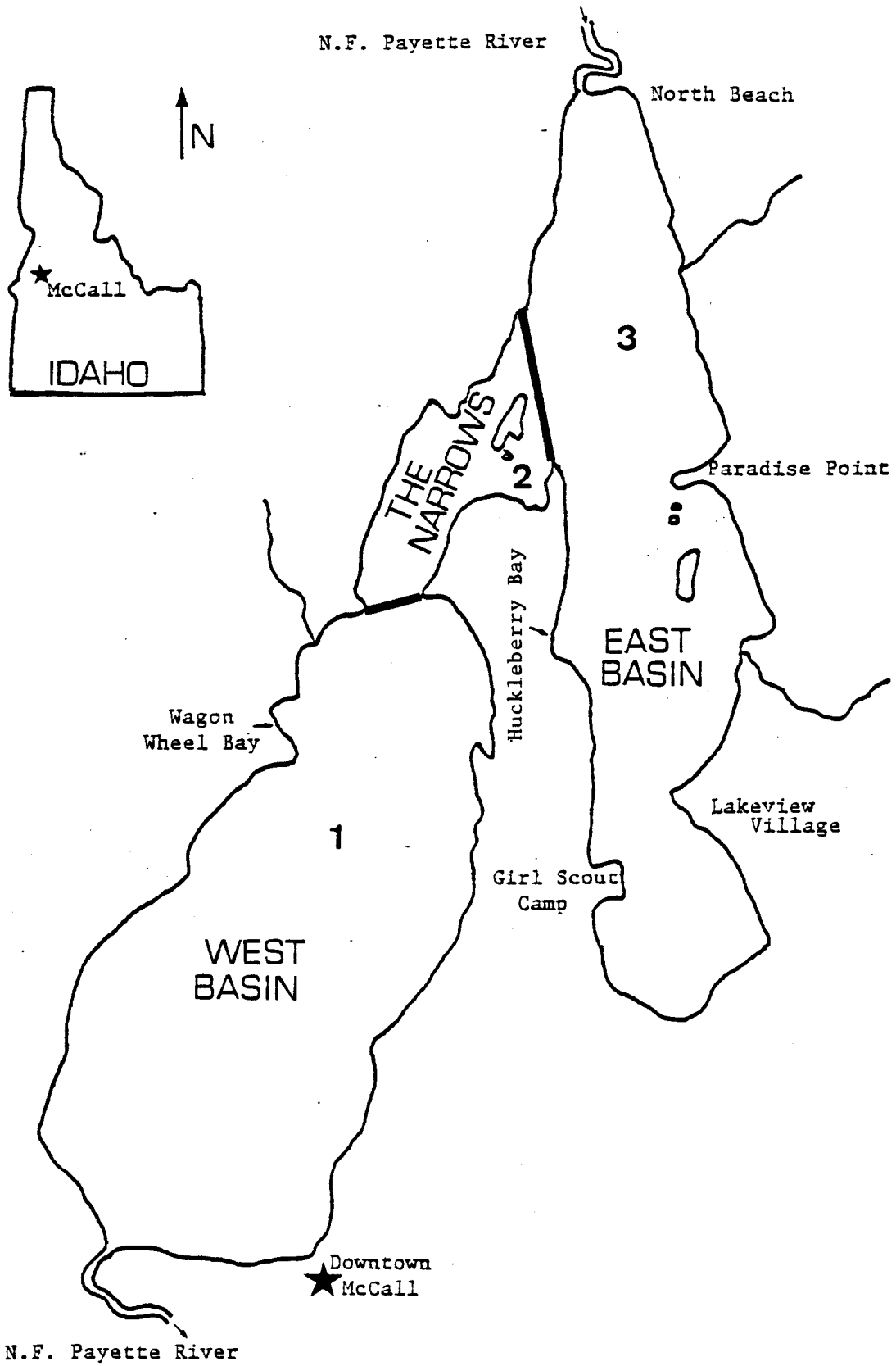


Figure 2. Map of Payette Lake denoting stratified sampling sections used during 1988 for trawling.

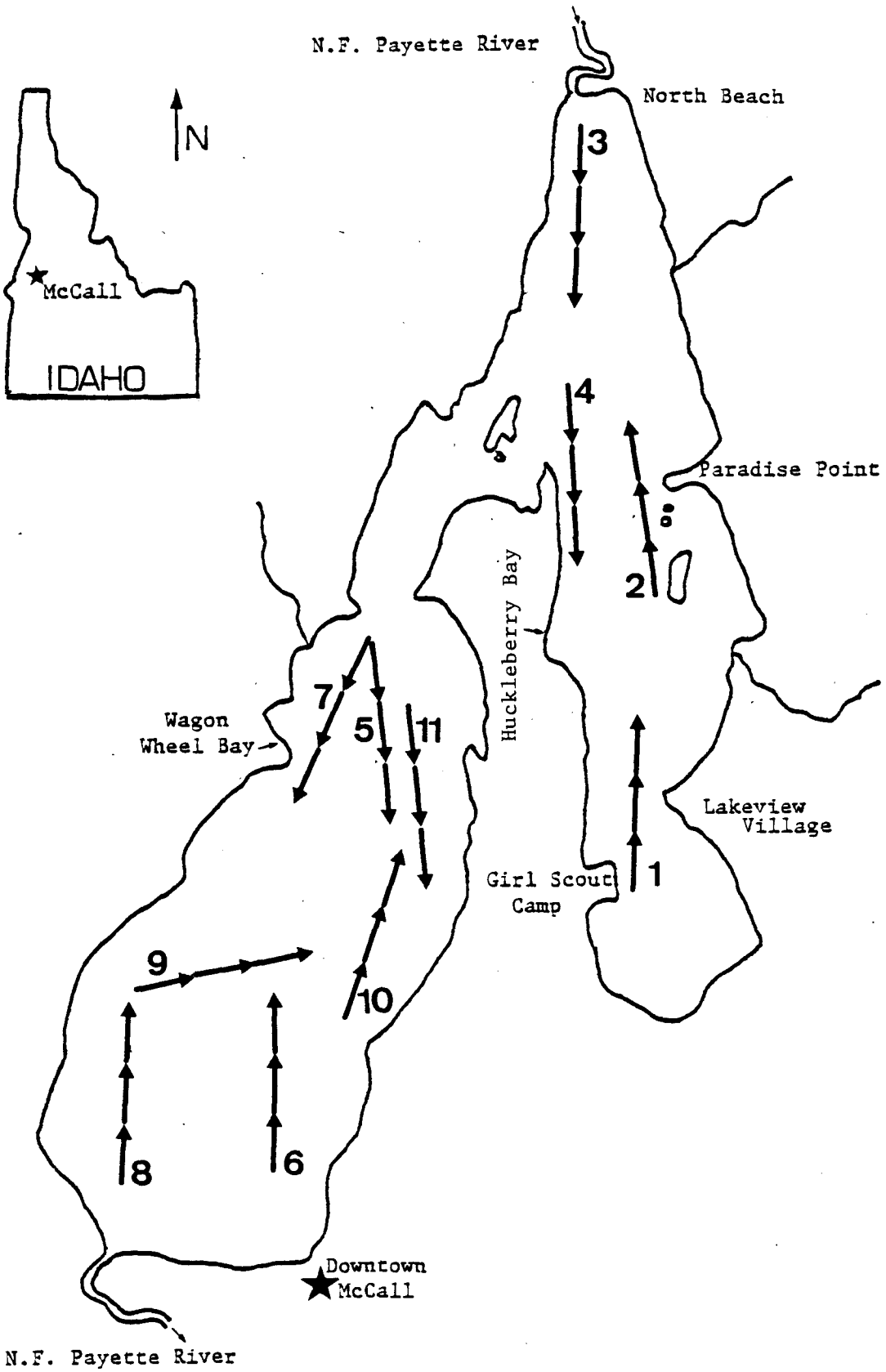


Figure 3. Map of Payette Lake denoting approximate locations of 11 transects sampled with trawling gear, July 12, 1988.

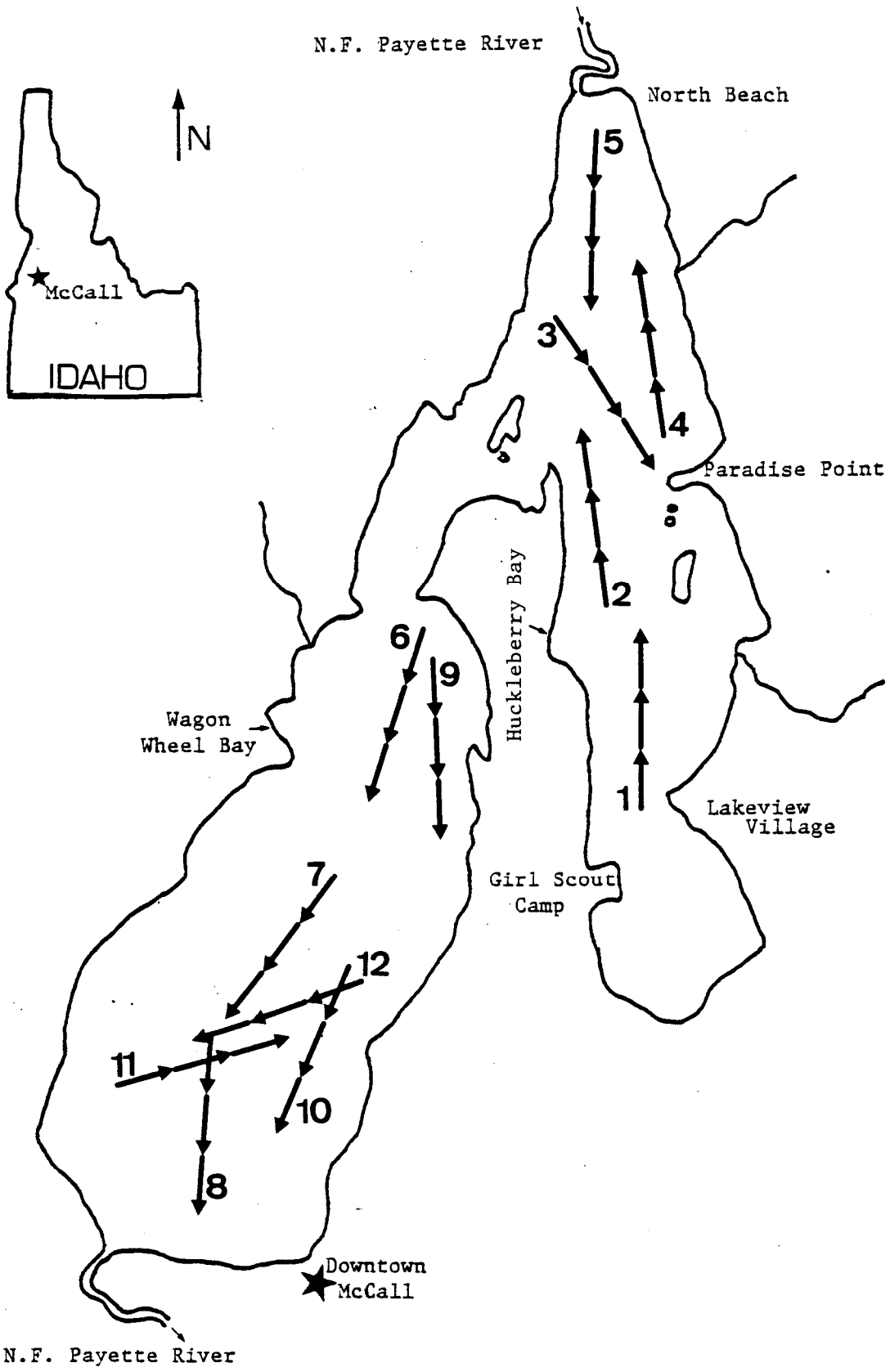


Figure 4. Map of Payette lake denoting approximate locations of 12 transects sampled with trawling gear, September 12, 1988.

## RESULTS

### Creel Survey

Anglers expended nearly 28,000 hours of effort at Payette Lake during May through October 1988 (Table 1). This represents a 100% increase in effort over the May through September period surveyed in 1987 (Table 2), and a 36% and 39% increase in effort over 1971 and 1972 estimates, respectively (Table 3). Approximately 73% of the total effort occurred during the period June through August (Table 1). Boat anglers comprised 88% of total effort, while bank anglers made up only 12%, of which 56% of total bank effort occurred in August (Table 4).

An overall catch rate for game fish species of 0.27 fish/hour was achieved, which is slightly less than the 1987 estimate of 0.31 fish/hour (Tables 1 and 2). Boat anglers experienced a catch rate six times greater than bank anglers (Table 4).

Total salmonid catch exceeded 4,800 fish, of which 41% was kokanee and 36% was hatchery rainbow trout (Table 5). Although the 1988 total catch was 22% greater than 1987 estimates (Table 6), it was substantially less than survey estimates in 1971 and 1972 (Table 6). Lake trout catch in 1988 was down 33% from 1987, while kokanee catch increased by 500% from an estimated 424 fish in 1987 to over 2,100 kokanee in 1988 (Table 6). The component of the catch supplied by hatchery trout was less significant by 28% in 1988 than 1987. Nearly 52% of the total catch at Payette Lake in 1988 occurred in June and July (Tables 1 and 5). Boat anglers caught 92% of the catch (Table 5).

Hatchery rainbow trout averaged 255 mm long in the creel, kokanee were approximately 306 mm mean total length, while lake trout averaged 517 mm (Table 7).

During the 1988 survey, hatchery rainbow trout comprised 12% to 75% of the catch by month for boat anglers, while ranging from 0% to 100% for bank anglers (Table 8). Kokanee were a significant species in the catch for boat anglers from May through August ranging from 43% to 67% of the catch (Table 8). Based on creel survey estimates of catch, hatchery rainbow trout returned to the creel at 9% considering a total plant of 21,000 catchables. This estimate represents a drop in return of catchable trout from the 15% observed in 1987. The predominant strain of rainbow trout was Mt. Lassen.

Expanded lake trout catch and yield estimates based on creel survey data were 0.15 fish/ha and 0.40 kg/ha, respectively. Estimated catch and yield for kokanee were 0.99 fish/ha and 0.23 kg/ha, respectively.

Based on tag returns, an exploitation rate of 1.4% was estimated to occur on the lake trout population of Payette Lake.

Table 1. Monthly statistics of fishing effort, catch rate and catch with corresponding coefficient of variation (CV)[a] derived from creel survey conducted at Payette Lake, Idaho, from May through October 1988.

| Month | Days surveyed[b] WE | WD | Effort (hours) | +CV | Catch rate (fish/hr) | +CV | Catch (number) | +CV |
|---|---|---|---|---|---|---|---|---|
| May | 2 | 1 | 3,535 | +48% | 0.09 | +67% | 499 | +41% |
| June | 4 | 2 | 7,039 | +56% | 0.61 | +103% | 1,599 | +18% |
| July | 3 | 3 | 7,215 | ±31% | 0.17 | +47% | 1,261 | +54% |
| August | 3 | 3 | 5,989 | +53% | 0.08 | +63% | 583 | +103 |
| September | 2 | 4 | 2,781 | ±66% | 0.45 | +93% | 969 | +71% |
| October | 3 | 3 | 1,195 | +69% | 0.007 | +143% | 230 | +142 |
| Totals | 17 | 16 | 27,75 | | | | 5,141 | |
| Mean[c] | | | | | 0.27 | | | |

[a]Coefficient of variation is standard error of an estimate divided by the estimate and is expressed as a percentage (from Cochran 1977). [b]WE denotes weekend and WD denotes weekday.
[c]Weighted by monthly effort.

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Table 2. Comparison of monthly fishery statistics derived from creel surveys conducted at Payette Lake, Idaho, 1987 and 1988. Creel survey data from 1987 are from Scully and Anderson (1989). Coefficient of variation (CV) is expressed as a percentage. I.D. denotes insufficient data.

| Month | Days surveyed WE | WD | Effort (hours) | +CV | Catch rate (fish/hr) | +CV | Catch (number) | +CV |
|---|---|---|---|---|---|---|---|---|
| May 1987 | 3 | 2 | 3,578 | ±41% | 0.16 | ±44% | 530 | ±72% |
| May 1988 | 2 | 1 | 3,535 | ±48% | 0.09 | ±67% | 499 | ±41% |
| Jun 1987 | 1 | 2 | 2,274 | ±I.D. | 0.27 | ±37% | 684 | ±12% |
| Jun 1988 | 4 | 2 | 7,039 | ±56% | 0.61 | ±103% | 1,599 | ±18% |
| Jul 1987 | 2 | 3 | 3,140 | ±71% | 0.24 | ±46% | 949 | ±97% |
| Jul 1988 | 3 | 3 | 7,215 | ±31% | 0.17 | ±47% | 1,261 | ±54% |
| Aug 1987 | 3 | 2 | 3,147 | ±20% | 0.61 | ±80% | 1,640 | ±76% |
| Aug 1988 | 3 | 3 | 5,989 | ±53% | 0.08 | ±63% | 583 | ±103% |
| Sep 1987 | 1 | 1 | 975 | ±I.D. | 0.27 | ±I.D. | 201 | ±I.D. |
| Sep 1988 | 2 | 4 | 2,781 | ±66% | 0.45 | ±93% | 969 | ±71% |
| Oct 1987 | -- | -- | -- | | -- | | -- | |
| Oct 1988 | 3 | 3 | 1,195 | ±69% | 0.007 | ±143% | 230 | ±142% |
| Totals | | | | | | | | |
| 1987 | 10 | 10 | 13,114 | | X = 0.31 | | 4,004 | |
| 1988 | 17 | 16 | 27,754 | | X = 0.27 | | 5,141 | |

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Table 3. Summaries of fishery statistics compiled from creel surveys conducted at Payette and Upper Payette lakes during 1971[a], 1972[b], 1987[c], and 1988. Fishing effort (F), mean catch rate (C/F) and catch (C) are reported as hours, fish/hour, and number, respectively. Data are for game fish only.

[a]from Welsh (1972).

| | Payette Lake | | | | Upper Payette Lake | | | |
|---|---|---|---|---|---|---|---|---|
| Year | Period surveyed | F (hrs) | C/F (fish/hr) | C (number) | Period surveyed | F (hrs) | C/F (fish/hr) | C (fish/hr) |
| 1971 | May 29-Sept 3 | 17,618 | 0.68 | 12,606 | May 29-Sep 3 | 7,725 | 0.81 | 5,211 |
| 1972 | May 27-Sep 8 | 16,934 | 0.74 | 14,589 | May 27-Sept 8 | 5,795 | 1.14 | 6,363 |
| 1987 | May-Sep | 13,114 | 0.31 | 4,004 | -- | -- | -- | -- |
| 1988 | May-Oct | 27,754 | 0.27 | 5,141 | June-Sept | 15,80 | 0.70 | 12,127 |

[b]from Welsh (1973).

[c]from Scully and Anderson (1989).

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Table 4. Monthly statistics of fishing effort, catch rate, and catch for boat and bank anglers derived from creel survey conducted at Payette Lake from May through October 1988. Percent of effort expended by and catch for boat and bank anglers is in parentheses.

| Month | Effort (hours) | Catch rate (fish/hour) | Catch (number) |
|---|---|---|---|
| May | | | |
| Boat | 3,462 (98) | 0.10 | 499 (100) |
| Bank | 73 (2) | 0 | 0 |
| June | | | |
| Boat | 6,886 (98) | 0.62 | 1,518 (95) |
| Bank | 153 (2) | 0.18 | 81 (5) |
| July | | | |
| Boat | 6,393 (89) | 0.18 | 1,141 (90) |
| Bank | 822 (11) | 0.05 | 120 (10) |
| August | | | |
| Boat | 4,125 (69) | 0.10 | 410 (70) |
| Bank | 1,867 (31) | 0.04 | 173 (30) |
| September | | | |
| Boat | 2,463 (89) | 0.51 | 922 **(95)** |
| Bank | 318 (11) | 0.04 | 47 (5) |
| October | | | |
| Boat | 1,074 (90) | 0.07 | 230 (100) |
| Bank | 121 (10) | 0 | 0 |
| Totals | | | |
| Boat | 24,403 (88) | X = 0.31[a] | 4,720 (92) |
| Bank | 3,354 (12) | X = 0.05[a] | 421 (8) |

[a]Weighted by monthly effort.

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Table 5. Monthly estimates of catch (numbers) per fish species for boat and bank anglers at Payette Lake from May through October 1988. Estimates based on proportions observed during angler interviews per month.

| Month | Number per species | | | | | | |
|---|---|---|---|---|---|---|---|
| | Hatchery rainbow | Wild rainbow | Kokanee | Lake trout | Cutthroat trout | Yellow perch | Subtotal |
| May | | | | | | | |
| Boat | 165 | 0 | 334 | 0 | 0 | 0 | 499 |
| Bank | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| June | | | | | | | |
| Boat | 176 | 112 | 959 | 176 | 64 | 0 | 1,487 |
| Bank | 0, | 0 | 0 | 0 | 0 | 112 | 112 |
| July | | | | | | | |
| Boat | 416 | 51 | 567 | 139 | 0 | 0 | 1,173 |
| Bank | 88 | 0 | 0 | 0 | 0 | 0 | 88 |
| August | | | | | | | |
| Boat | 292 | 0 | 221 | 0 | 0 | 0 | 513 |
| Bank | 0 | 0 | 0 | 0 | 0 | 70 | 70 |
| September | | | | | | | |
| Boat | 504 | 107 | 48 | 0 | 107 | 155 | 921 |
| Bank | 48 | 0 | 0 | 0 | 0 | 0 | 48 |
| October | | | | | | | |
| Boat | 172 | 58 | 0 | 0 | 0 | 0 | 230 |
| Bank | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Totals | | | | | | | |
| Boat | 1,725 | 328 | 2,129 | 315 | 171 | 155 | 4,823 |
| Bank | 136 | 0 | 0 | 0 | 0 | 182 | 318 |
| Grand Totals | 1,861 | 328 | 2,129 | 315 | 171 | 337 | 5,141 |

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Table 6. Summary of estimated catch (number) per species by anglers at Payette Lake during creel surveys conducted in 1971, 1972, 1987, and 1988. Percent of total catch per species is in parentheses.

| | Number per species | | | | | | |
|---|---|---|---|---|---|---|---|
| Year | Hatchery rainbow | Wild rainbow | Kokanee | Lake trout | Cutthroat trout | Yellow perch | Subtotals |
| 1971 | 5,145[a] (41) | - | 7,217 (57) | 244 (2) | 0 | 0 | 12,606 |
| 1972 | 7,209[a] (49) | - | 6,811 (47) | 427 (3) | 0 | 142 (1) | 14,589 |
| 1987 | 2,554<br>4,004 (64) | (8) | 304 (10) | 424 (12) | 469 | 0 (6) | 253 |
| 1988 | 1,861 (36) | 328 (6) | 2,129 (41) | 315 (6) | 171 (3) | 337 (8) | 5,141 |

[a]Welsh (1972, 1973) did not separate between hatchery rainbow trout and wild/natural rainbow trout; for purposes of comparison, all are considered as hatchery origin.

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Table 7. Length statistics by month for game fish species appearing in the creel at Payette Lake, May through October 1988. Sample size equals n and mean total length (mm) plus or minus standard deviation (mm) appear at X TL + SD.

| | Species of fish | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hatchery rainbow | | Wild rainbow | | Kokanee | | Lake trout | | Cutthroat trout | | Yellow perch | |
| Month | N | XTL+SD | N | XTL±SD | N | XTL±SD | N | XTL±SD | N | XTL+SD | N | XTL+SD |
| May | 3 | 270±87 | 2 | 370±99 | 4 | 315±17 | - | -- | | -- | | -- |
| June | 18 | 241±19 | | - | 18 | 305±19 | 4 | 506±276 | | -- | 2 | 130±14 |
| July | 6 | 272±19 | | - | 8 | 306±37 | 6 | 525±190 | | -- | | -- |
| August | 7 | 261± 7 | | | 1 | 320 | | -- | | -- | | -- |
| September | 14 | 257±26 | | - | 1 | 280 | | -- | 2 | 280±0 | 3 | 250±0 |
| October | 3 | 273± 6 | 1 | 310 | | -- | | -- | | -- | | -- |
| Totals | 51 | - | 3 | | 32 | | 10 | | 2 | | 5 | |
| Means[a] | | 255 | | 350 | | 306 | | 517 | | 280 | | 202 |

[a]Weighted by monthly averages.

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Table 8. Percent species composition of catch for boat and bank anglers at Payette Lake from May through October 1988.

| Month | Species of fish | | | | | |
|---|---|---|---|---|---|---|
| | Hatchery rainbow | Wild rainbow | Kokanee | Lake trout | Cutthroat trout | Yellow Perch |
| May | | | | | | |
| Boat | 33 | 0 | 67 | 0 | 0 | 0 |
| Bank | 0 | 0 | 0 | 0 | 0 | 0 |
| June | | | | | | |
| Boat | 12 | 8 | 64 | 12 | 4 | 0 |
| Bank | 0 | 0 | 0 | 0 | 0 | 100 |
| July | | | | | | |
| Boat | 35 | 5 | 48 | 12 | 0 | 0 |
| Bank | 100 | 0 | 0 | 0 | 0 | 0 |
| August | | | | | | |
| Boat | 57 | 0 | 43 | 0 | 0 | 0 |
| Bank | 0 | 0 | 0 | 0 | 0 | 100 |
| September | | | | | | |
| Boat | 54 | 12 . | 5 | 0 | 12 | 17 |
| Bank | 100 | 0 | 0 | 0 | 0 | 0 |
| October | | | | | | |
| Boat | 75 | 25 | 0 | 0 | 0 | 0 |
| Bank | 0 | 0 | 0 | 0 | 0 | 0 |
| Means | | | | | | |
| Boat | 44 | 8 | 38 | 4 | 3 | 3 |
| Bank | 33 | 0 | 0 | 0 | 0 | 33 |

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## Gillnetting and Tagging

A total of 90 lake trout were captured in gill nets set in Payette Lake from May to October 1988, and of this total, 64 fish were marked with floy tags. A cumulative length-frequency histogram of lake trout total lengths, which includes five fish caught by angling, reveals a range in lengths of 29 cm to 96 cm and a mean length of 72.5 cm + 15 cm SD (Figure 5). Average weight of lake trout from combined gill net and rod and reel samples was 5.8 kg + 2.9 kg SD.

The total length-weight relationship for lake trout was described by the equation $Y = 0.0024 (L^{3}\text{-}^{39})$ (Figure 6).

Condition indices for lake trout by 5 cm length group ranged from 0.80 to 1.40 (Table 9). Larger lake trout were typically in more robust condition.

Stomach contents of lake trout revealed a diet of fish and invertebrates. Fish could not be identified due to advanced digestion.

Age and growth data were not gathered from lake trout scales as anticipated due to extreme difficulty in readily identifying annuli. This was especially true for larger mature fish.

## Mid-water Trawling-Kokanee Abundance

Estimated total kokanee abundance_ in Payette Lake in July 1988 was 187,000 fish (Table 10), not including kokanee larger than 130 mm. Too few larger kokanee were collected to derive reliable estimates for older fish. No age determination was made for this sample, but the majority. were probably age 0+, being comprised of both natural and hatchery fish. Estimates were made by length group as partitioned from the length frequency histogram (Figure 7). Total biomass of the sample was estimated as 475 kg, while estimated average kokanee density (all fish combined) was 87 fish/ha.

Estimated total kokanee abundance in Payette Lake in September 1988 was 119,100 fish (Table 10), including fish up to 180 mm long. Again, no estimate was derived for fish larger than 180 mm. Year class composition of the estimate was 109,700 of the 1987 year class (age 0+), and a total of 9,400 for the 1986 year class (age 1+). The 1986 year class was particularly weak and was represented by just one fish in the trawling sample. No estimates of the 1982 to 1985 kokanee year classes (ages 2+ to 5+) are available. Estimated survival of the 1988 hatchery release was approximately 10%.

Total biomass of the September sample was estimated as 800 kg, while estimated average kokanee density (all fish combined) was 55 fish/ha (Table 10). Length-frequency of kokanee in the September trawling sample is shown in Figure 20.

No Mysis relicta were collected in Payette Lake during either of the two sampling periods.

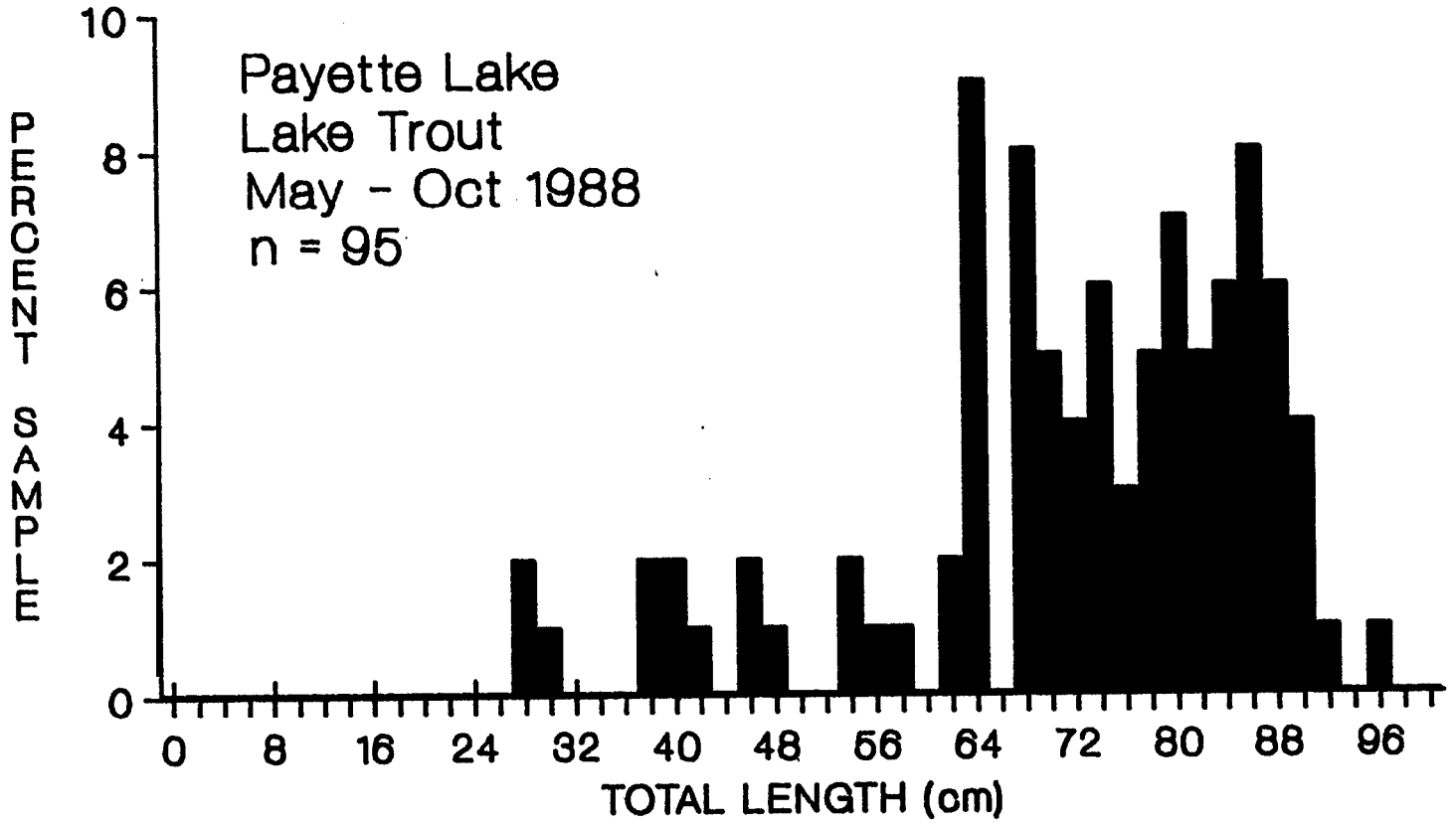



Figure 5. Cumulative length-frequency diagram of combined lake trout samples collected with gill nets and hook-and-line from Payette Lake, May to October, 1988.

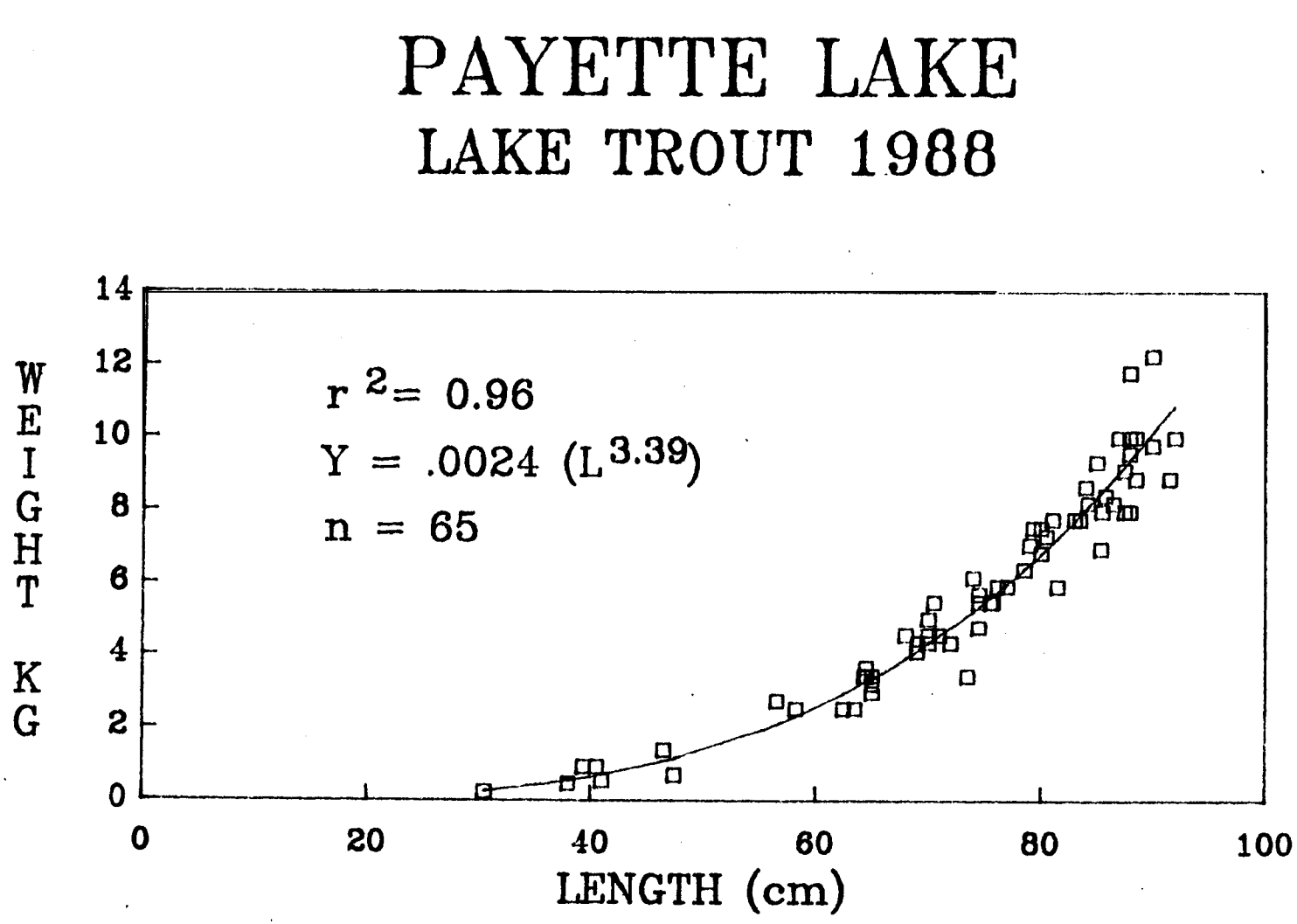



Figure 6. Length-weight relationship of lake trout from Payette Lake collected by gill nets and hook-and-line, May to October, 1988.

Table 9. Fulton condition factor (k) for lake trout by 5 cm length group collected by gillnetting and angling in Payette Lake, 1988.

| Length Group (mm) | Number | Mean condition index (K) |
|---|---|---|
| 25.1-30.0 | 0 | -- |
| 30.1-35.0 | 1 | 0.80 |
| 35.1-40.0 | 2 | 1.20 |
| 40.1-45.0 | 2 | 1.00 |
| 45.1-50.0 | 2 | 1.00 |
| 50.1-55.0 | 0 | -- |
| 55.1-60.0 | 2 | 1.40 |
| 60.1-65.0 | 8 | 1.20 |
| 65.1-70.0 | 6 | 1.34 |
| 70.1-75.0 | 8 | 1.27 |
| 75.1-80.0 | 9 | 1.35 |
| 80.1-85.0 | 8 | 1.37 |
| 85.1-90.0 | 15 | 1.37 |
| 90.1-95.0 | 2 | 1.22 |
| 95.1-100.0 | 0 | |

Table 10. Year class abundance, total biomass (kg) and density (fish/ha) of kokanee population sampled with trawling gear in July and September 1988, in Payette Lake, Idaho.[a]

| Length group (mm) | Abundance (number) | X weight (kg) | Biomass (kg) | Density (fish/ha) |
|---|---|---|---|---|
| July 12, 1988 | | | | |
| <70 | 168,000 | Not available | not available | 78 |
| 70-130 | 19,000 | 0.025 | 475 | 9 |
| Totals | 187,000 | 0.025 | 475 | 87 |
| | | | (0.22 kg/ha) | |

| Year class | Age | Abundance (number) | X weight (kg) | Biomass (kg) | (fish/ha) |
|---|---|---|---|---|---|
| September 12, 1988 | | | | | |
| 1987 | 0+ | 109,700 | 0.003 | 377 | 51 |
| 1986 | 1+ | 9,400 | 0.045 | 423 | 4 |
| Totals | | 119,100 | | 800 | 55 |
| | | | | (0.37 kg/ha) , | |

[a]Estimates were not derived for 2+ and older kokanee due to inefficiency at sampling larger fish.

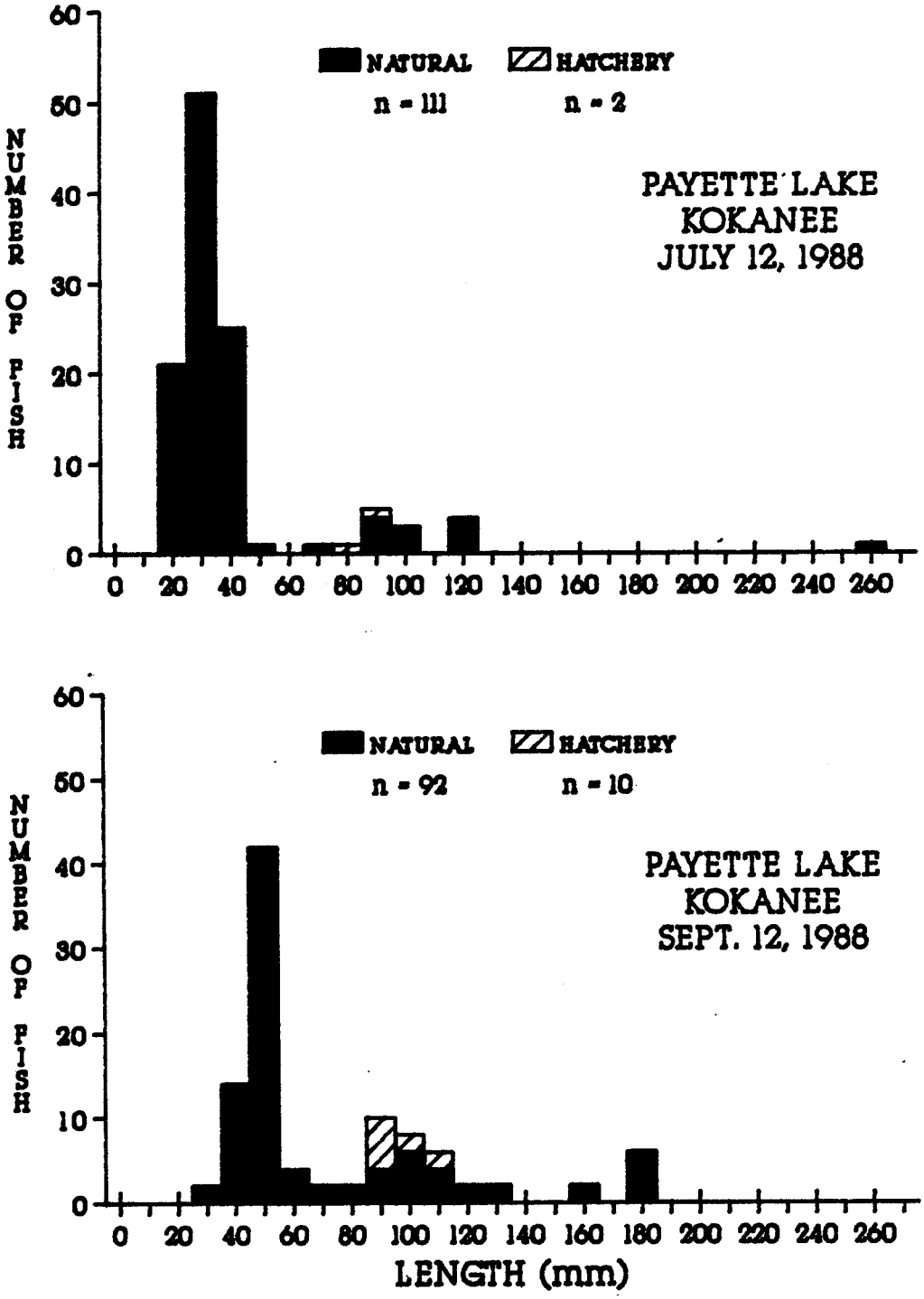



Figure 7. Length-frequencies of kokanee sampled by trawling in Payette Lake in July and September, 1988. Separation of natural and hatchery kokanee (deformed opercula) were simply visual observations and are not meant to represent actual proportions.

## Limnological Sampling

Macrozooplankton generic composition found in 1988 in Payette Lake included Copepoda, Daphnia, Bosmina, Holopedium, Diaphanosoma, Leptodora, and Polyphemus. Copepods were typically the dominant member of the plankton community and composed the greatest overall percentage in May (Figures 8-10). Bosmina was the predominant genera in July, while Daphnia made up from 15% to 32% of August samples (Figures 8-10).

Copepod densities were greater than cladoceran densities throughout the sampling period, except for July (Figure 11; Appendix 6). Cladoceran production peaked in July where it was slightly higher than copepod production. Total zooplankton density ranged from about six organisms/liter in August to almost 11 organisms/liter in July (Figure 11; Appendix 6). Daphnia and Bosmina were the most common cladoceran species found during all sampling periods. Other cladoceran species were rarely found in zooplankton for samples.

The middle-east section of Payette Lake overall possessed a mean zooplankton density 39% to 62% greater than other lake sections sampled (Figure 12; Appendix 7). The southeast section possessed the lowest total densities and the fewest genera.

The largest zooplankton present in Payette Lake during 1988 was Leptodora which averaged 1.2 mm long (Figure 13; Appendix 8). This genera was followed in size by Holopedium, Daphnia, Copepoda, and Bosmina. No discernible trends in zooplankton length for each genus were found.

Comparisons of mean densities among 1980 and 1988 zooplankton data suggest no significant changes (Table 11). The three major zooplankters in Payette Lake appear to have decreased in size from 1980 to 1988 (Table 12).

Temperature profiles taken in May from three locations of Payette Lake at surface to 10 m in depth were similar (Figure 14). Surface temperatures at North Beach were 3° to 6°C cooler due to the influence of the North Fork Payette River. Obvious thermoclines existed in Payette Lake during mid-July and mid-September, 1988 (Figure 15).

Water transparencies measured on May 11, 1988, at six locations around Payette Lake averaged 6.2 m and ranged from 5.0 m to 7.4 m.

## DISCUSSION

Because of the inherent low productivity of the system, management options for Payette Lake are somewhat limited. Species most likely to provide angler opportunities in Payette Lake on a sustained basis are

# PAYETTE LAKE ZOOPLANKTON
## MAY 11, 1988

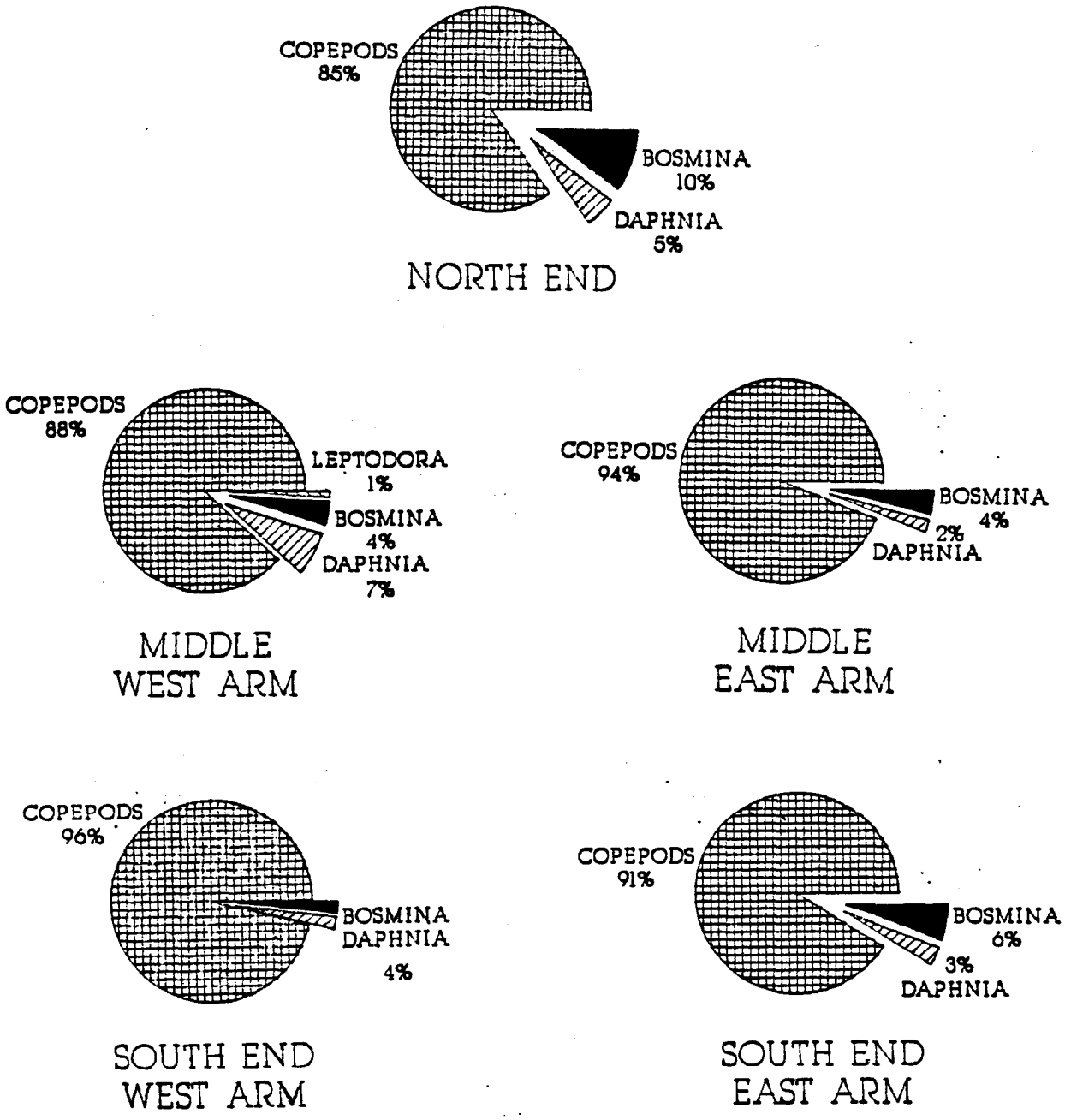
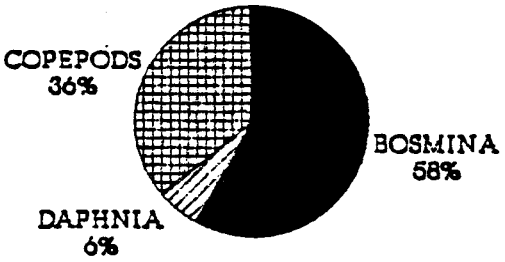
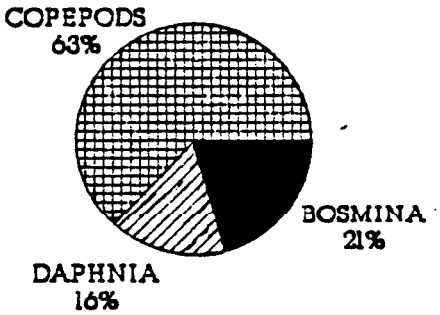



Figure 8. Pie chart representing percent species composition of macrozooplankton collected from five sections of Payette Lake, May 11, 1988.

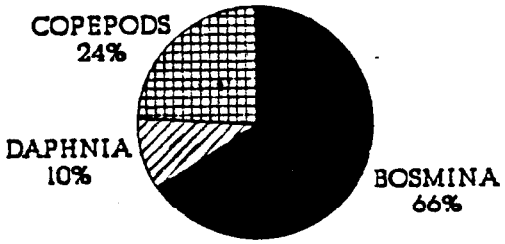
# PAYETTE LAKE ZOOPLANKTON
## JULY 1, 1988



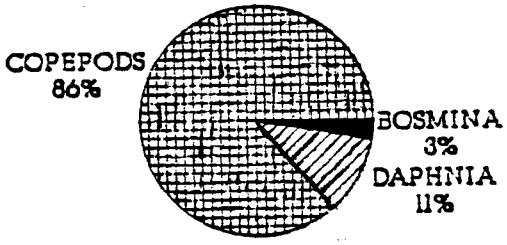

NORTH END




MIDDLE
WEST ARM




MIDDLE
EAST ARM




SOUTH END
WEST ARM

No Data Collected

SOUTH END
EAST ARM

Figure 9. Pie chart representing percent species composition o macrozooplankton collected from four sections (south east arm data not collected) of Payette Lake, July 1

# PAYETTE LAKE ZOOPLANKTON
## AUGUST 18, 1988

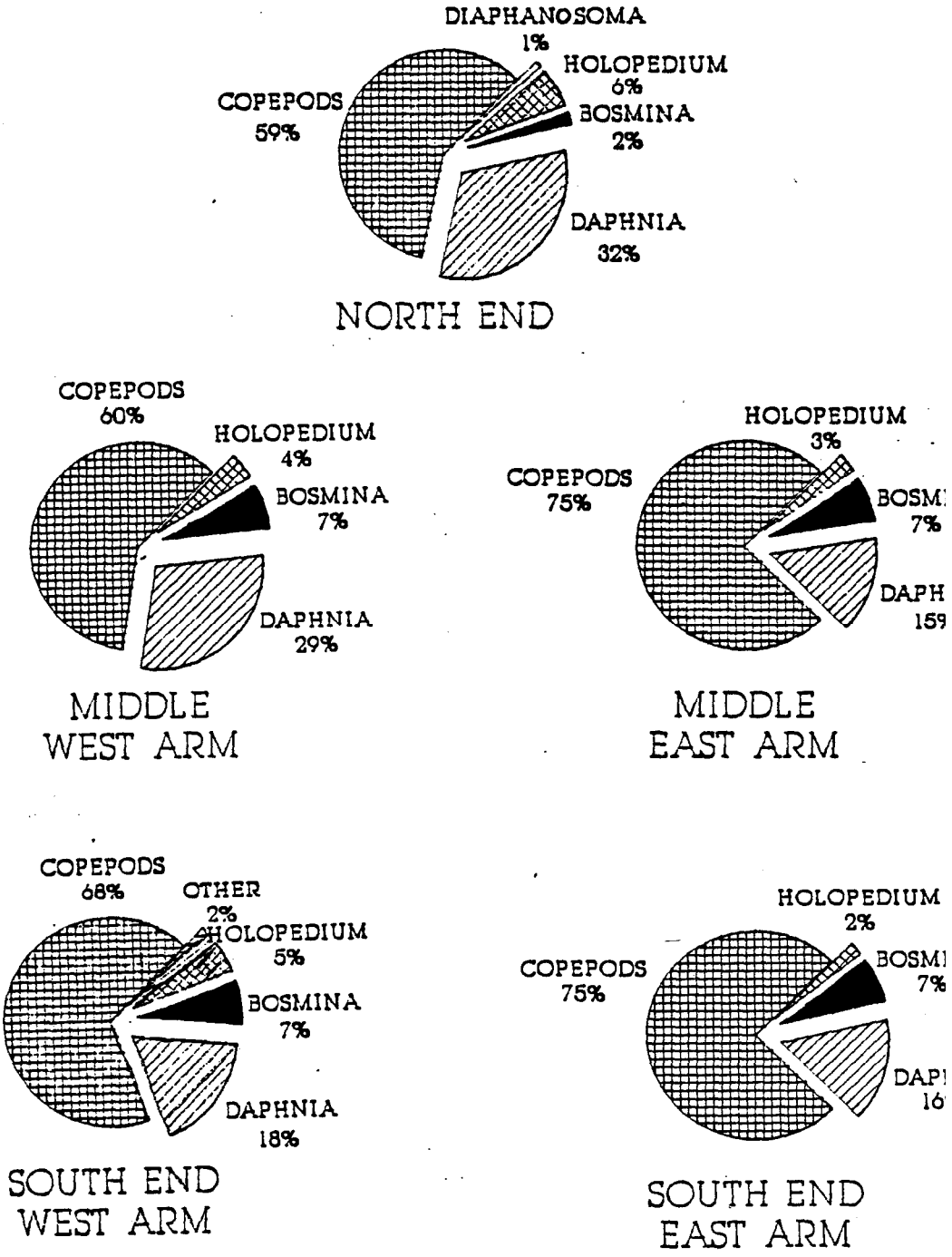



Figure 10. Pie chart representing percent species composition macrozooplankton collected from five sections of Pa Lake, August 18, 1988. Others include Diaphanosoma Polyphemus at 1.0% each.

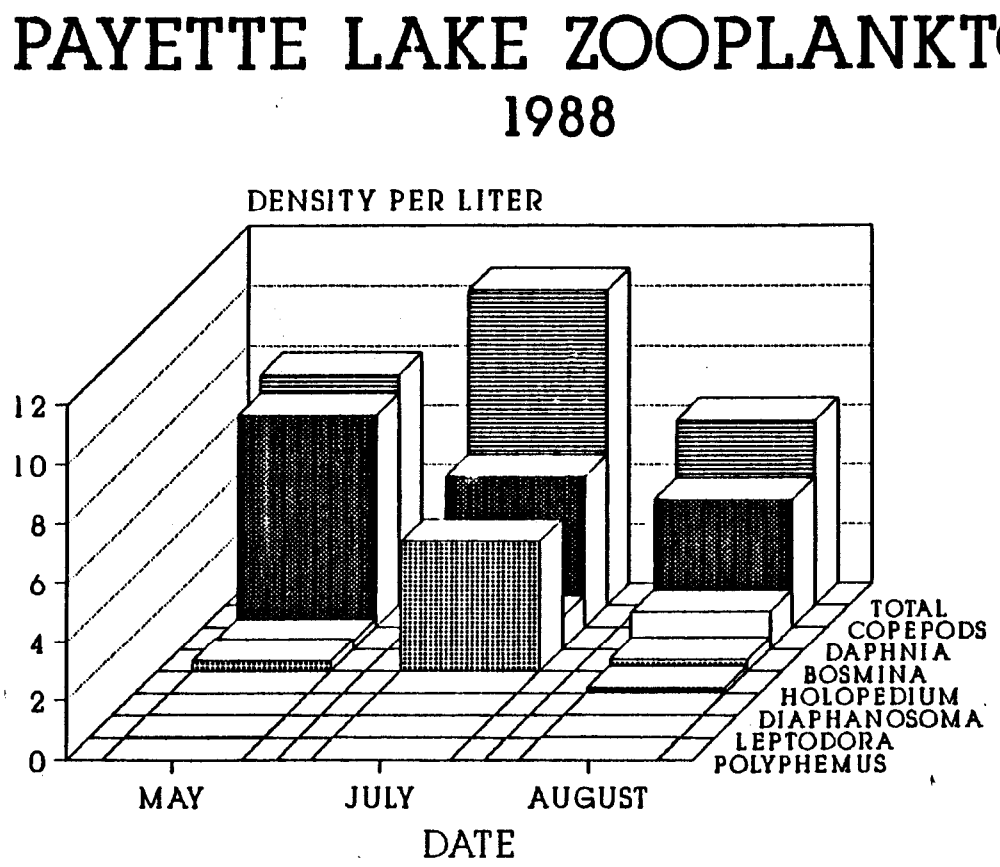



Figure 11. Mean zooplankton densities (organism/liter) found in Payette Lake, Idaho, 1988, compared among sampling dates. Data were collected from five sites around the lake during 1988 for each sample date except for July where four samples were taken.

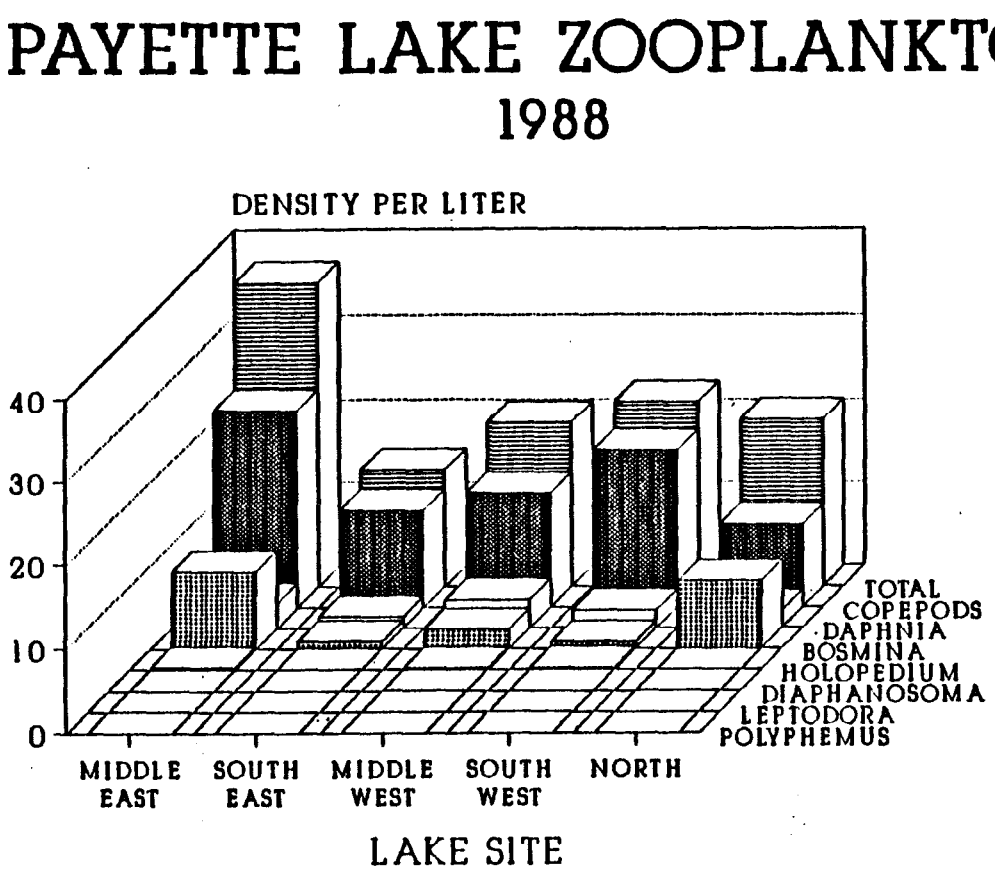



Figure 12. Mean zooplankton densities (organism/liter) found in Payette Lake, Idaho, 1988, compared among lake sampling sites. Data were collected May, July, and August 1988. In July, the south end-east arm had no data collected.

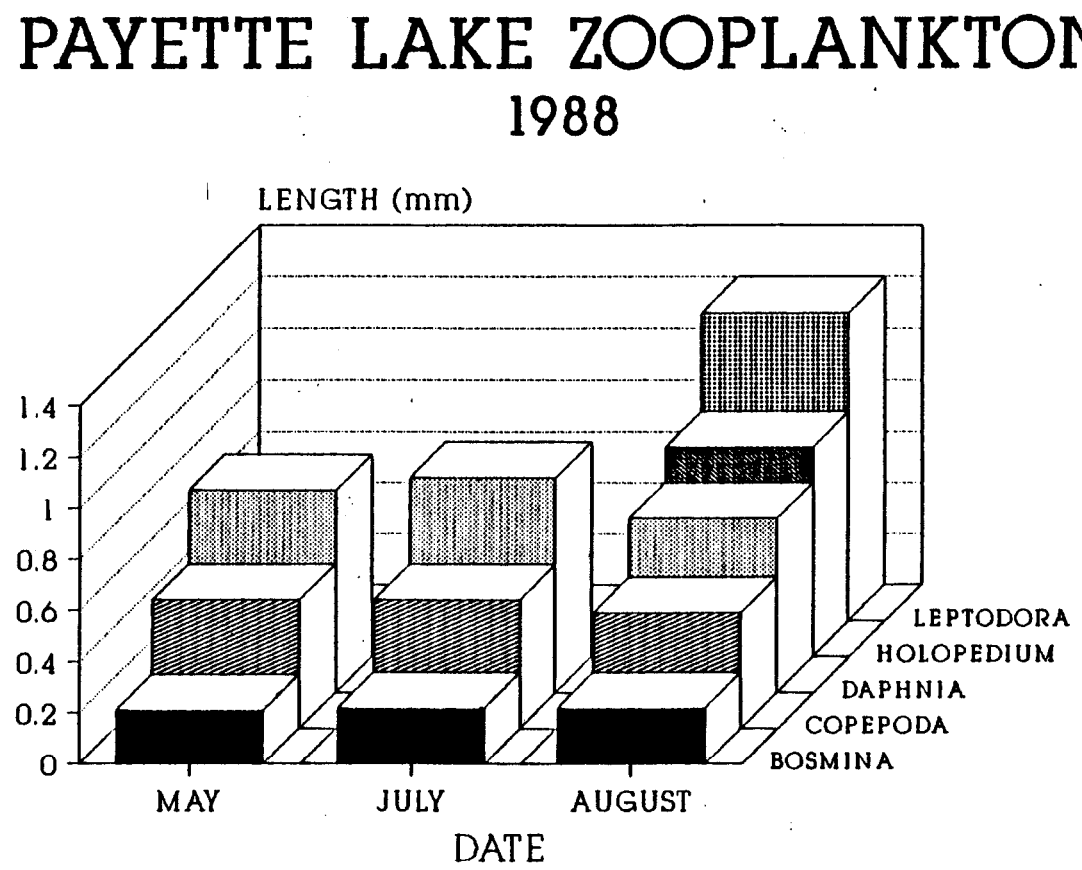



Figure 13. Mean zooplankton body length (mm) per organism found in Payette Lake, Idaho, 1988, compared among sampling dates.

Table 11. Mean densities (organisms/liter) of zooplankton for all samples combined compared among the years 1980 and 1988, Payette Lake, Idaho.

| | Organisms/liter | |
|---|---|---|
| Organism | 1980 | 1988 |
| Copepoda | 6.50 | 5.55 |
| Bosmina | 2.24 | 1.53 |
| Daphnia | 0.73 | 0.86 |
| Diaphanosoma | 0.03 | 0.03 |
| Holopedium | 0.16 | 0.18 |
| Leptodora | 0.0005 | 0.02 |
| Totals | 9.66 | 8.20 |

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Table 12. Mean body length (mm) from the three major zooplankters for all samples combined compared among the years 1980 and 1988, Payette Lake, Idaho.

| | Mean body length (mm) | |
|---|---|---|
| Organism | 1980 | 1988 |
| Copepoda | 0.65 | 0.48 |
| Bosmina | 0.37 | 0.22 |
| Daphnia | 1.20 | 0.77 |

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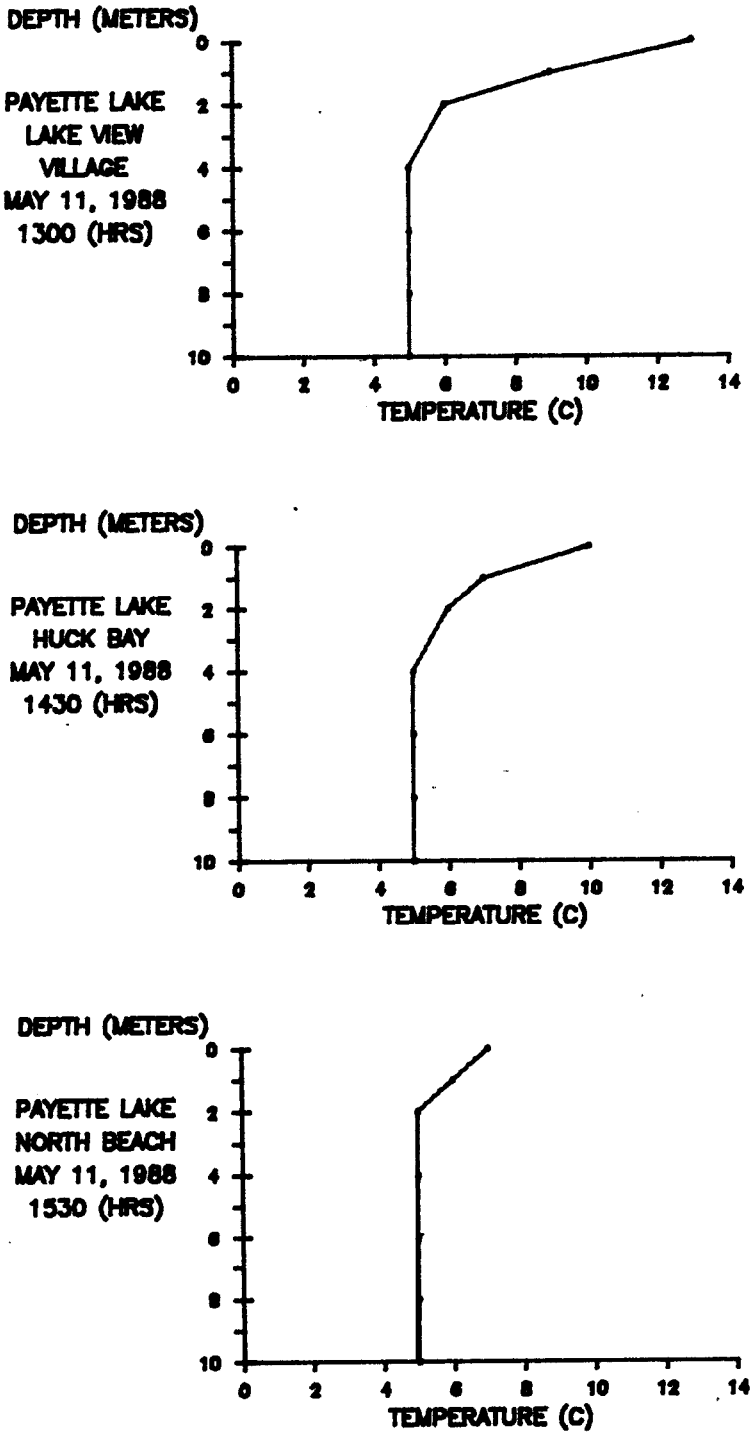


Figure 14. Temperature (°C) profiles taken at three locations in Payette Lake, Idaho, in May 1988.

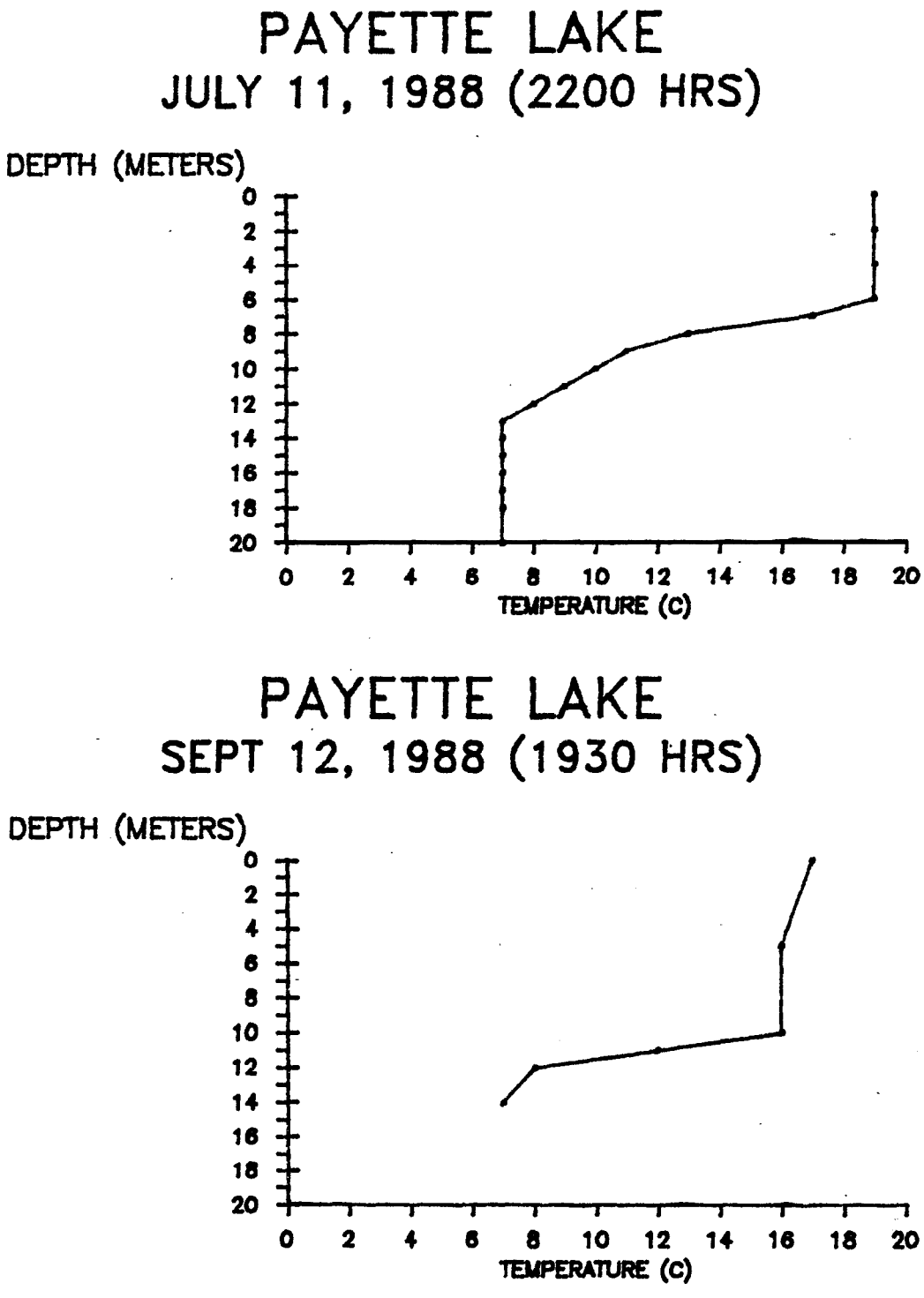


Figure 15. Temperature (°C) profiles taken in July and September 1988, in Payette Lake, Idaho.

kokanee, westslope cutthroat trout, lake trout, and limited numbers of catchable rainbow trout. There may be additional species that warrant future consideration for introduction, but the current management direction should be given adequate time to properly evaluate.

The goals of the current management for Payette Lake are to enhance and develop the kokanee population to optimum density, increase exploitation on lake trout, provide a surface-oriented littoral fishery with cutthroat trout, and to maintain some limited fishing opportunity for catchabl_e rainbow trout. These goals are realistic and achievable for the Payette Lake system, and public support for the programs is growing.

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**JOB PERFORMANCE REPORT**

State of: Idaho Project

Name: Regional Fishery Management Investigations

Title: McCall Subregion River and Stream Investigations

No.: F-71-R-13

Job No. 3 (MC)-c

Period Covered: July 1; 1988 to June 30, 1989


**ABSTRACT**

**Big Creek**

Catch-and-release regulations were implemented on Big Creek, Middle Fork Salmon River drainage, in 1982 following numerous reports that the quality of cutthroat trout angling had declined. No follow-up had been conducted since' to assess the effects of regulation changes on this important cutthroat trout fishery.

A summary is provided of pre- and post-1982 data regarding the Big Creek resident salmonid fishery. Mean length of westslope cutthroat trout, as sampled by angling, appears to have increased by just over 2.5 cm since 1982. Correspondingly, catch rates for all species, particularly cutthroat trout, have improved dramatically.

**North Fork Payette River**

Snorkeling" was used in the North Fork below the town of McCall to assess the success of 1987 introductions of brown trout. No brown trout were observed. The vast majority of fish observed were northern squawfish.

Substrate core samples were collected at two locations on the North Fork above Payette Lake. Ocular estimates of surface sediments were made in the same areas. Gravel size particles (>4.75 mm-76 mm) composed the greatest percentage of total substrate composition observed by both techniques.

A local contractor, using a 4-wheel drive backhoe, loosened approximately 1,500 $m^2$ of gravel in ten different sites on the North Fork, in an attempt to make the sites more usable for spawning kokanee.

Kokanee spawners entered the North Fork in early September and lasted through early November 1988. A peak count of nearly 13,200 fish was observed in mid-September. The male:female ratio was 1:1.17. Males possessed a mean fork length of 326 mm while females had a mean fork length of 306 mm. Spawning escapement based on kokanee counts was estimated at 26,000 fish. Mature kokanee from the 1988 spawning run ranged in age from 3+ to 5+ as determined from otoliths.

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## OBJECTIVES

To maintain information for fishery management activities and decisions for rivers and streams.

## RECOMMENDATIONS

1. Continue to monitor the Big Creek fishery through public contact and sampling by fishery personnel.

2. Continue to assess mining activities and their effects on both resident and anadromous fish in Big Creek.

3. Brown trout stockings should proceed in the North Fork Payette River on an annual basis and corresponding assessments made to monitor success of the program.

4. Monitor the kokanee spawning run in the North Fork Payette River as needed to assess potential escapement. Obtain fecundity estimates from females to estimate potential egg deposition.

5. Develop additional spawning areas for kokanee, if possible, to enhance natural recruitment to the Payette Lake system.

## INTRODUCTION

### Big Creek

Big Creek, the largest tributary to the Middle Fork Salmon River (MFSR), originates in the Salmon River Mountains at approximately 2,743 m elevation, flows about 80 km through forest, meadow, and steep canyon, and enters the MFSR at 366 m elevation (Figures 1-3). Big Creek is surrounded by the 1.01 million-hectare Frank Church/River of No Return Wilderness.

Big Creek supports both anadromous and resident salmonid species. Both anadromous (steelhead) and nonmigratory (resident) rainbow trout Oncorhynchus mykiss are indigenous to the drainage, as are westslope cutthroat trout Oncorhynchus clarki lewisi, bull trout Salvelinus confluentus, spring chinook salmon, and mountain whitefish. One introduced salmonid, brook trout, is found only in isolated headwater areas of Big Creek.

The bulk of the cutthroat trout present in the Middle Fork drainage, are probably produced in a limited number of tributaries such as Big, Indian, Loon, Marble, and Pistol creeks (Thurow 1985). As Thurow (1985) succinctly stated, the significance of the previously noted tributaries to the production of cutthroat trout in the Middle Fork drainage cannot be overemphasized. He further suggested the Middle Fork tributaries may also produce most of the cutthroat trout found in sections of the Salmon River.

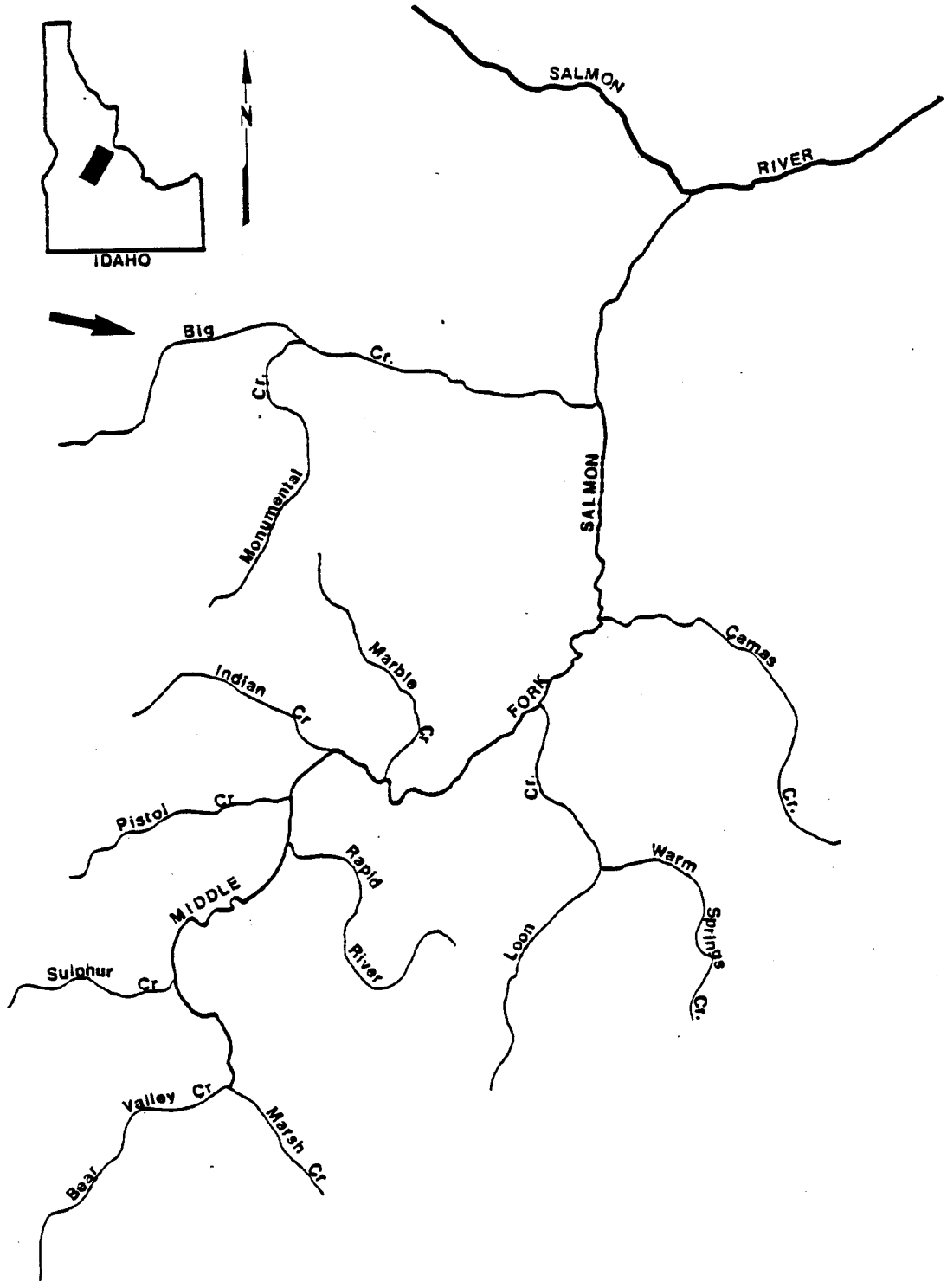



Figure 1. Middle Fork Salmon River drainage, Idaho, illustrating location of Big Creek. Adopted with permission from Thurow (1982).

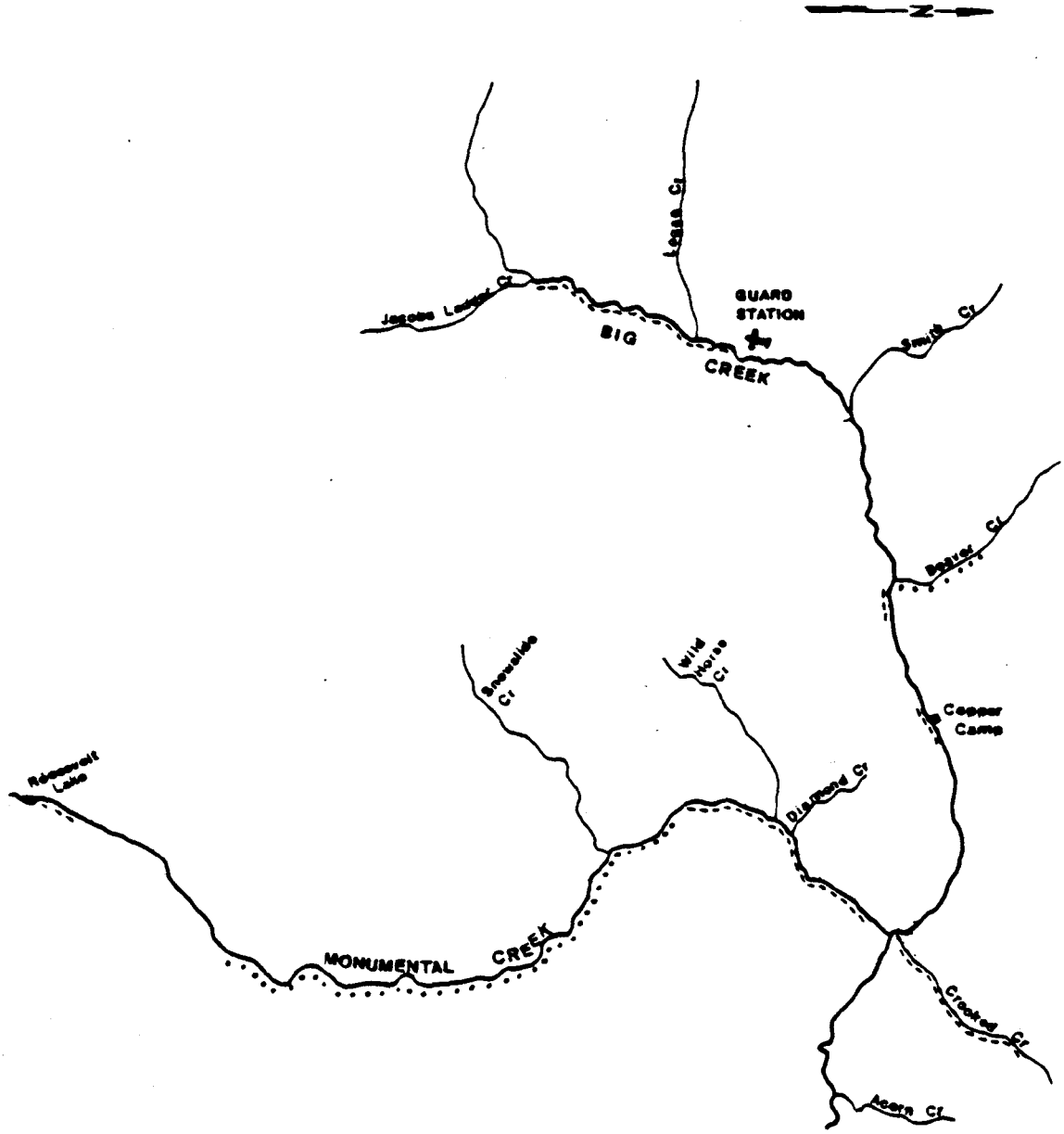



Figure 2. Map of upper Big Creek from headwaters downstream to Acorn Creek, Middle Fork Salmon River drainage, Idaho. Adopted with permission from Thurow (1982).

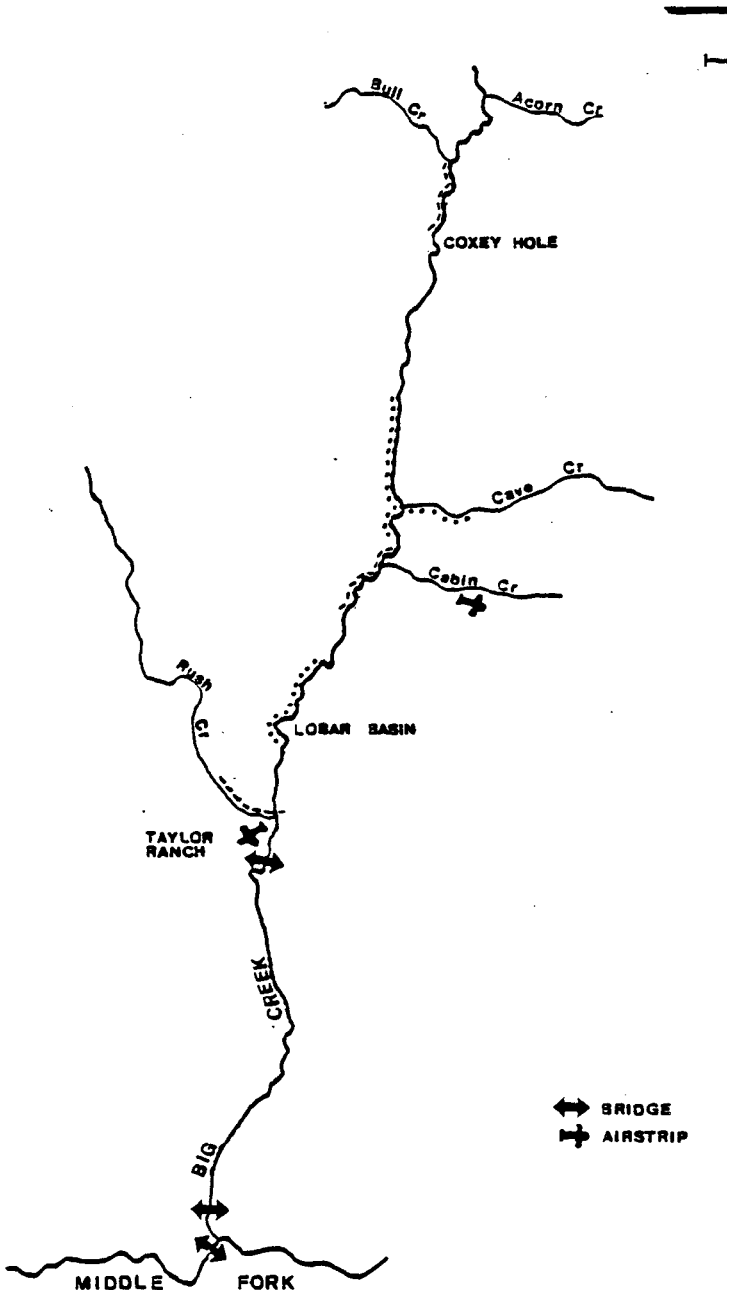



Figure 3. Map of lower Big Creek from Acorn Creek downstream to Middle Fork Salmon River drainage, Idaho. Adopted wi permission from Thurow (1982).

During the period 1980 to 1982, the IDFG received numerous public comments concerning a discernable decline in the quality of the cutthroat trout fishery, particularly that there were fewer and smaller fish. In 1982, the Fish and Game Commission adopted catch-and-release regulations for Big Creek and its tributaries from the mouth upstream to Smith Creek. From Smith Creek upstream a three trout limit was imposed (Figures 2 and 3).

Bull trout basically remain an enigma in Big Creek, as they are in many drainages in Idaho. No life history information exists for this stock, however they are sympatric with westslope cutthroat trout. Thurow (1985) provided a detailed synopsis of bull trout distribution and abundance in the Middle Fork drainage. Additionally, information on bull trout abundance has been collected since 1985 incidental to juvenile salmon and steelhead densities in select transects of Big Creek and tributaries.

Although most of the Big Creek drainage lies within dedicated wilderness, human-related activities have detrimentally altered sections of several tributaries, and precious metal mining has caused extensive sediment transport to Big and Monumental creeks (Thurow 1985). Defunct, ongoing, and proposed mining activities pose the single greatest threat to Big Creek stocks of anadromous and resident fishes.

The purpose of this section of the report is to summarize available and pertinent information collected before and after 1982 concerning the Big Creek resident salmonid fishery to facilitate future management **endeavors.**

## North Fork Payette River

The North Fork Payette River contains three major water bodies along its length; these are Upper Payette Lake, Payette lake, and Cascade Reservoir. All three systems are regulated to some degree by irrigation needs, or in the case of Cascade Reservoir, by hydropower. Depending on water demands and river reach, the North Fork flows are controlled by these withdrawals, and consequently, the type and quality of fisheries in the various reaches are vastly different. Some excellent rainbow trout fishing can be found below Cascade Reservoir, especially in the Cabarton reach of the North Fork (Anderson et al. 1987), and a good spring rainbow trout fishery exists above Cascade Reservoir. However, the majority of angler pressure elsewhere in the North Fork is largely supported by hatchery catchable-size rainbow trout, since wild/natural trout production appears minimal (Scully and Anderson 1989).

In 1987, the IDFG introduced the Plymouth Rock strain of brown trout into the North Fork below Payette Lake in hopes of establishing a viable self-sustaining trout fishery (Anderson et al. 1987; Scully and Anderson 1989). During the summer of 1988, snorkeling was used to assess the success of these stockings.

Kokanee spawn in the North Fork in a limited reach immediately above Payette Lake only as far north as Fisher Creek, however most of the natural recruitment to the lake system is produced in this section (Figure 4). Above Fisher Creek, the North Fork is steeper in gradient and not usable by spawning kokanee. The IDFG is concerned with the quality and amount of available spawning habitat for kokanee in the North Fork. In 1988, a program to improve quality of spawning gravels was undertaken in the North Fork by physically manipulating the substrate.

Additionally, increased management efforts have been focused on the dynamics of the Payette Lake kokanee population through direct population assessment and hatchery supplementation. Since the North Fork Payette River provides essentially the only spawning area for kokanee in the Payette Lake system, it was deemed necessary and logistically possible to enumerate the kokanee spawning run to gather data on potential wild/natural recruitment.

## TECHNIQUES USED

### Big Creek

Length-frequency histograms were compiled from unpublished data collected by IDFG personnel using hook-and-line sampling in July and August 1981, August 1982, August 1983, July 1987, and July 1988. The first two samples are pre-catch-and-release data, while the latter three samples are post-catch-and-release. Species plotted were cutthroat trout, rainbow-steelhead trout, bull trout, and mountain whitefish. Anadromous and nonmigratory forms of rainbow trout were grouped-since they could not be differentiated in the field. Data for all species concerned per sample date were not available. Pre-catch-and-release data were plotted in 10 mm length increments. Since there was no consistency among years in the way anglers measured fish (English vs. metric system) after catch-and-release implementation, individual fish were best fit into approximate 2.5 cm increments of length. Relative comparisons, when feasible, were made among and between years using catch rates, size, and species composition.

Relative comparisons are made between findings of Thurow (1982) and post-1982 unpublished data to assess any detectable population changes following initiation of catch-and-release regulations.

Additionally, miscellaneous creel survey data supplied to McCall fishery staff were summarized.

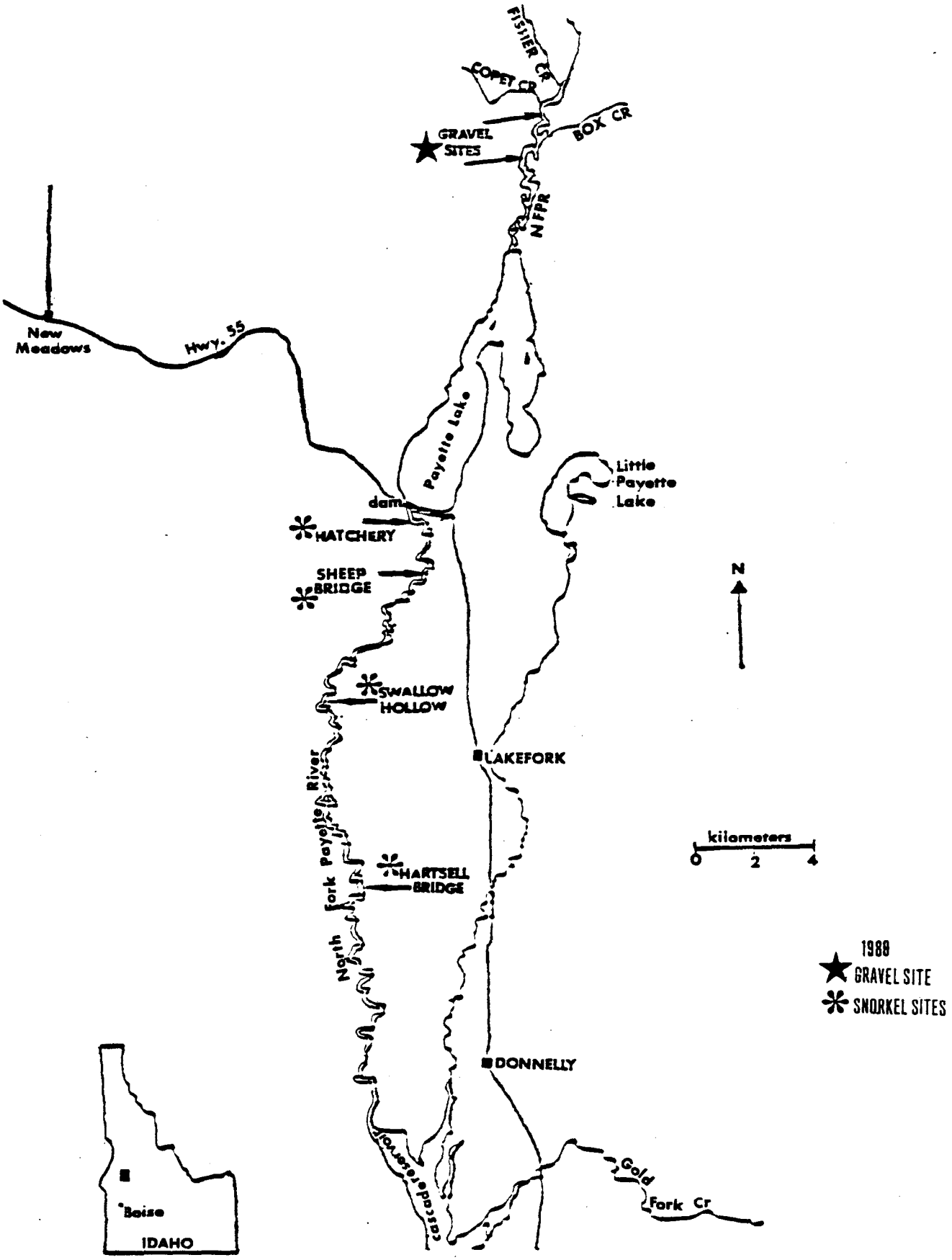



Figure 4. Map of the North Fork Payette River between Cascade Reservoir and Fisher Creek above Payette Lake illustrating locations of snorkeling sites and core sampling and gravel rehabilitation sites, 1988. Kokanee spawners were enumerated from above Payette Lake upstream to Fisher Creek.

## North Fork Payette River

### Snorkeling

On June 30, 1988, the North Fork Payette River was snorkeled at four predetermined locations between the McCall Hatchery and Hartsell Bridge (Figure 4). Two snorkelers floated downstream in a side-by-side manner and identified and counted, if feasible, all fish species observed. Particular attention was given to salmonids, especially brown trout which were stocked in 1987 between 51 mm and 152 mm long.

### Substrate Composition and Rehabilitation

On July 26, 1988, substrate core samples were collected from two locations on the North Fork Payette River between Copet Creek and the upstream end of slack water above Payette Lake (Figure 4). Legal descriptions of sample sites in a downstream direction are Rge. 3E., Twp. 20N., Sec. 35 NW1/4NW1/4, and Rge. 3E., Twp.20N., Sec. 35, SW1/4SW1/4. Six replicate core samples per location were taken using methodology described by Corley and Burmeister (1978). The samples were separated at streamside according to particle size using U.S. Standard sieve sizes of 75, 37.5, 19, 9.5, 6.3, 4.75, 2.36, 0.85, and 0.053 millimeters. After separating the samples by particle size each size group was then measured volumetrically by water displacement.

On July 26 surface sediment were classified in these same areas using the ocular technique described by Petrosky and Holubetz (1985) and Torquemada and Platts (1984). Percentage data from both core sample and ocular estimates were aresine-transformed to more closely develop a normal distribution and to assist in developing mean values and 95Z confidence limits (Zar 1974).

On August 2 a local McCall contractor, under the supervision of IDFG personnel, used a 4-wheel drive backhoe to loosen approximately 1,547 $m^2$ of gravel in 10 different sites in the North Fork below Fisher Creek (Figure 4). The backhoe was used to physically lift the uppermost layer of substrate to break the armoring and then to drop each load on site in an attempt to make the sites more usable for spawning kokanee. Use of these sites by spawning kokanee was monitored throughout the late summer to late fall period.

### Kokanee Spawning Run

During the period September 3 to October 29, 1988, spawning kokanee were enumerated in the North Fork Payette River above Payette Lake up to Fisher Creek (Figure 4). A single observer walking upstream counted all kokanee within site in such a manner as to avoid directly disturbing fish and compromising count accuracy, Fish were counted on a weekly basis on

randomly selected days during the morning from 0800 to 1200 hours. Data recorded throughout the spawning run were number of both live and dead fish and fork length of a random sample of male and female mortalities.

Otoliths were collected from a random sample of male and female specimens throughout the spawning run to determine age at maturity. Otoliths were placed in a 60% glycerin: 40% alcohol mixture in 1.8 ml microcentrifuge tubes for a time necessary to allow clearing and elucidation of annual growth rings and then viewed under a dissection microscope.

## RESULTS

### Big Creek

Cutthroat trout have exhibited a gradual increase in mean length of over 2.5 cm since catch-and-release regulations were implemented on Big Creek (Table 1). Cutthroat trout have also remained the dominant salmonid species in Big Creek. Length frequencies by species per sample date are found in Figures 5-9.

Catch rates for all species, particularly cutthroat trout, appear to have improved dramatically (Table 2).

Miscellaneous creel survey data collected at Taylor Ranch during the summer of 1985 reveals catch rates for cutthroat trout averaging well over 2 fish/hour (Appendix 9). Total catch rates for all species combined were generally over 3 fish/hour.

### North Fork Payette River

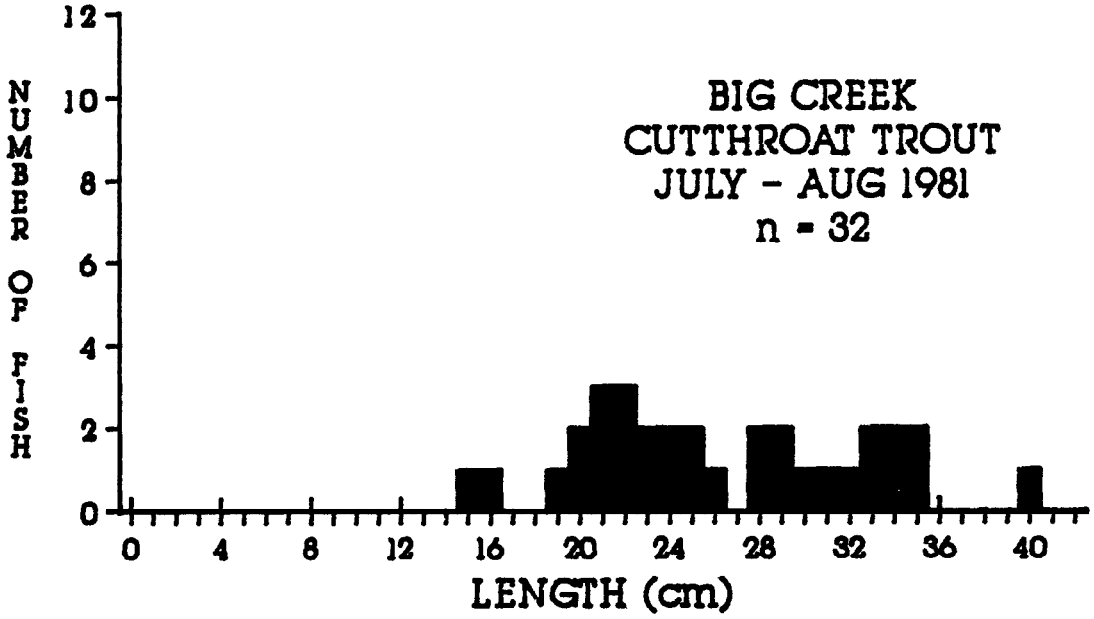
None of the brown trout stocked in 1987 were observed while snorkeling four sections of the North Fork Payette River below Payette Lake (Table 3). The vast majority of fish observed were nongame species with northern squawfish being most common. A total of only 3 trout were seen throughout the reach snorkeled.

Prior to treatment, gravel-size particles (>4.75 mm-76 mm) composed the greatest percentage of total substrate composition observed by using both the core and ocular sampling techniques (Table 4). The percentages reported for gravel based on the two techniques is relatively close, however a noticeable discrepancy occurred at individual sites between the two methods in both the fine-coarse sediment and rubble-size particles (Table 4).

The upstream site appeared to be less suitable for kokanee spawning than the downstream site due to the greater proportion of fine-coarse sediment present.

Table 1. Summary of total length (cm) statistics for fish species sampled from Big Creek with hook and line in 1981, 1982, 1983, 1987 and 1988. Percent species composition found in parentheses.

| | | Mean total length (cm) per species | | | |
|---|---|---|---|---|---|
| Date | Statistic | Rainbow steelhead trout | Cutthroat trout | Bull trout | Mountain White fish |
| July-August 1981 | x length | - | 26.0 | - | - |
| | SD | - | 6.6 | - | - |
| | n | - | 34 | - | - |
| August 6, 1982 | x length | - | 26.2 | - | - |
| | SD | - | 5.8 | | |
| | n | | 23 | - | - |
| August 11-22, 1983 | x length | 18.9 | 28.1 | 27.7 | - |
| | SD | 3.7 | 5.7 | 5.3 | - |
| | n | 79 (57) | 47 (34) | 13 (9) | - |
| July 27-31, 1987 | x length | 19.4 | 31.7 | 35.0 | 363 |
| | SD | 5.1 | 6.1 | 6.9 | 3.5 |
| | n | 19 (16) | 91 (77) | 5 (4) | 3 (3) |
| July 29-31, 1988 | x length | 14.7 | 29.0 | 34.1 | 31.7 |
| | SD | 3.2 | 5.2 | 4.3 | 2.8 |
| | n | 84 (14) | 385 (62) | 21 (3) | 133 (21) |



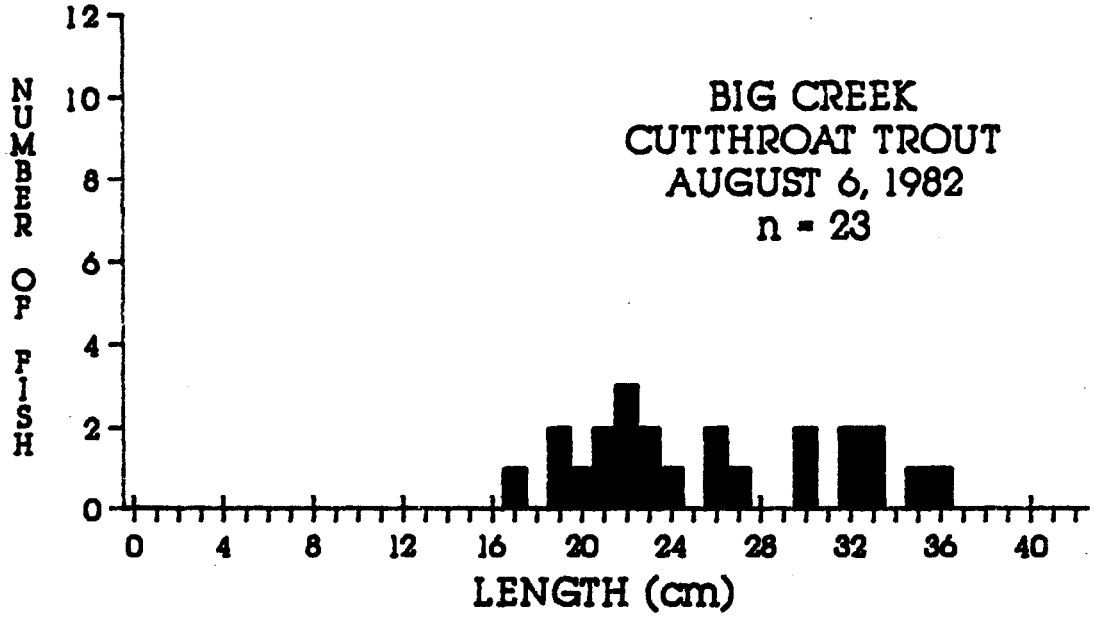




Figure 5. Length-frequency diagrams of cutthroat trout samples collected with hook-and-line from Big Creek in 1981 and 1982.

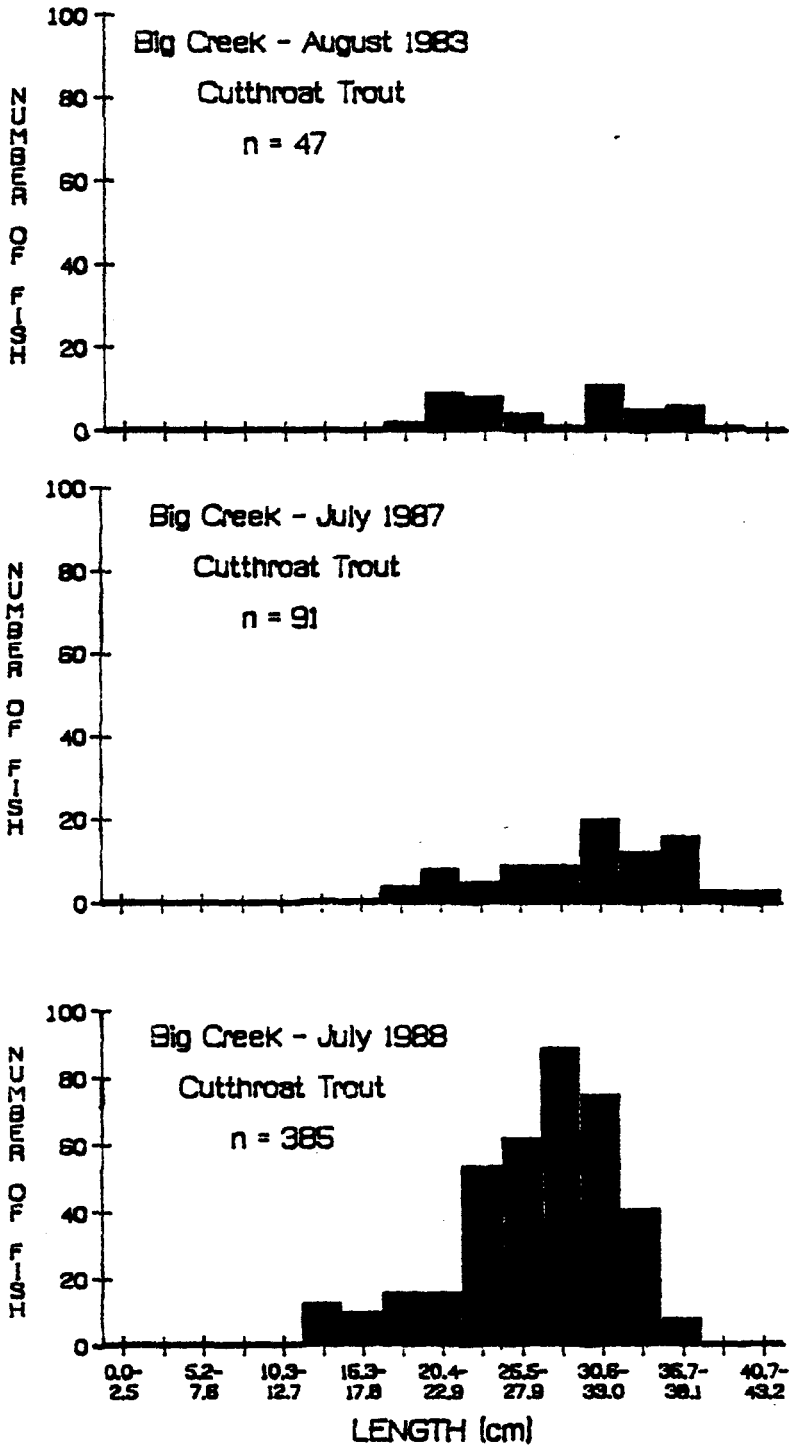



Figure 6. Length-frequency diagrams of cutthroat trout samples collected with hook-and-line from Big Creek in 1983, 1987, and 1988.

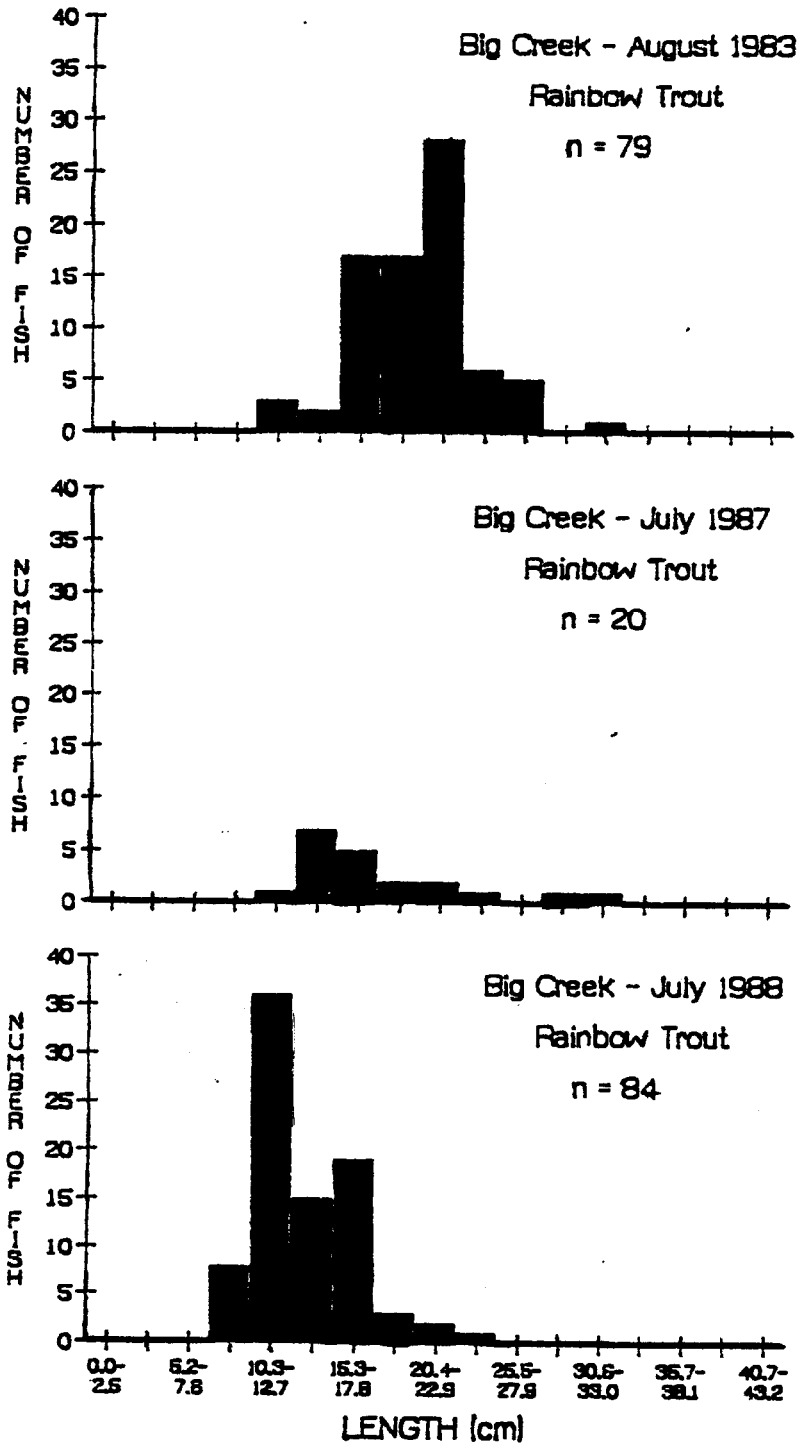



Figure 7. Length-frequency diagrams of rainbow trout (steelhead) samples collected with hook-and-line from Big Creek in 1983, 1987, and 1988.

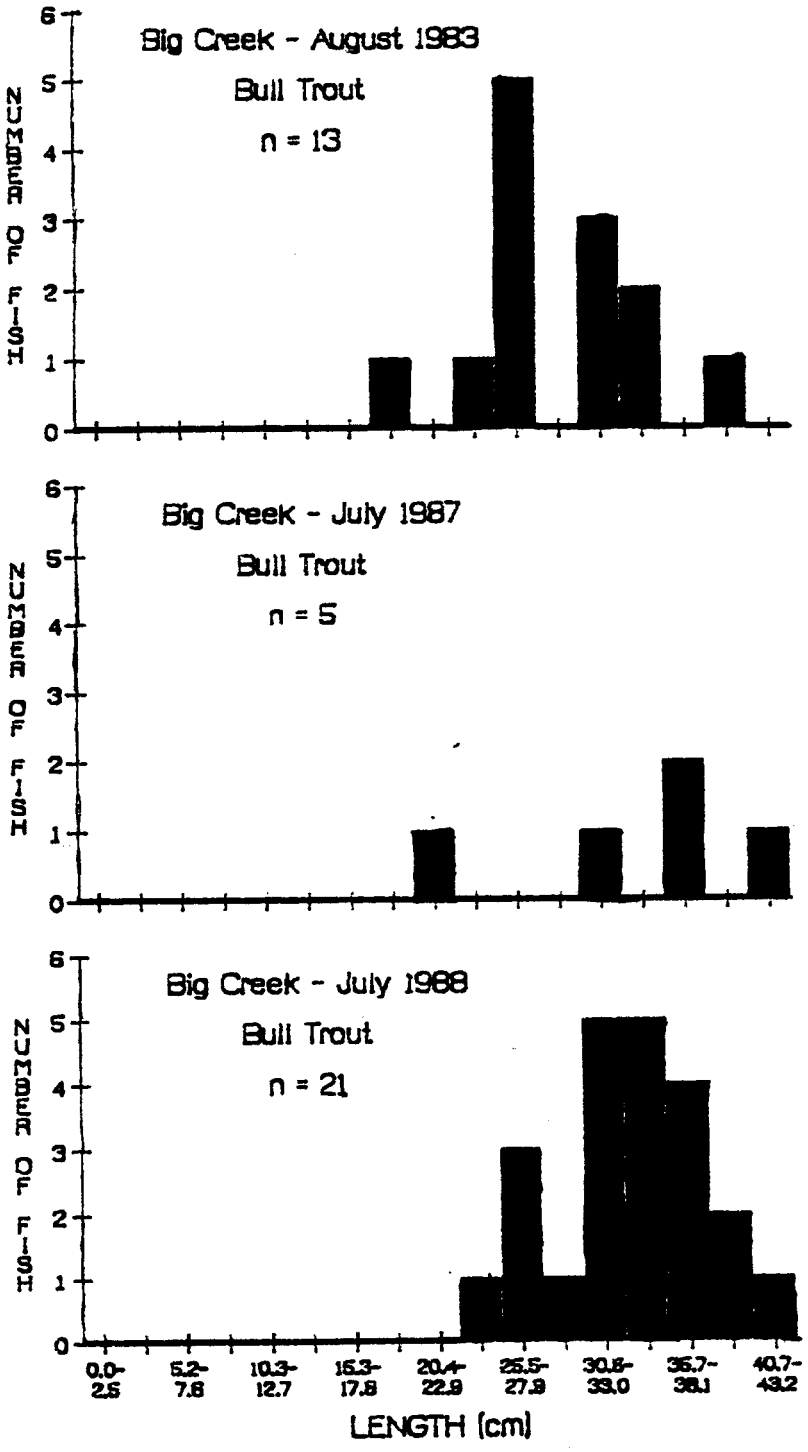



Figure 8. Length-frequency diagrams of bull trout samples collected with hook-and-line from Big Creek in 1983, 1987, and 1988.

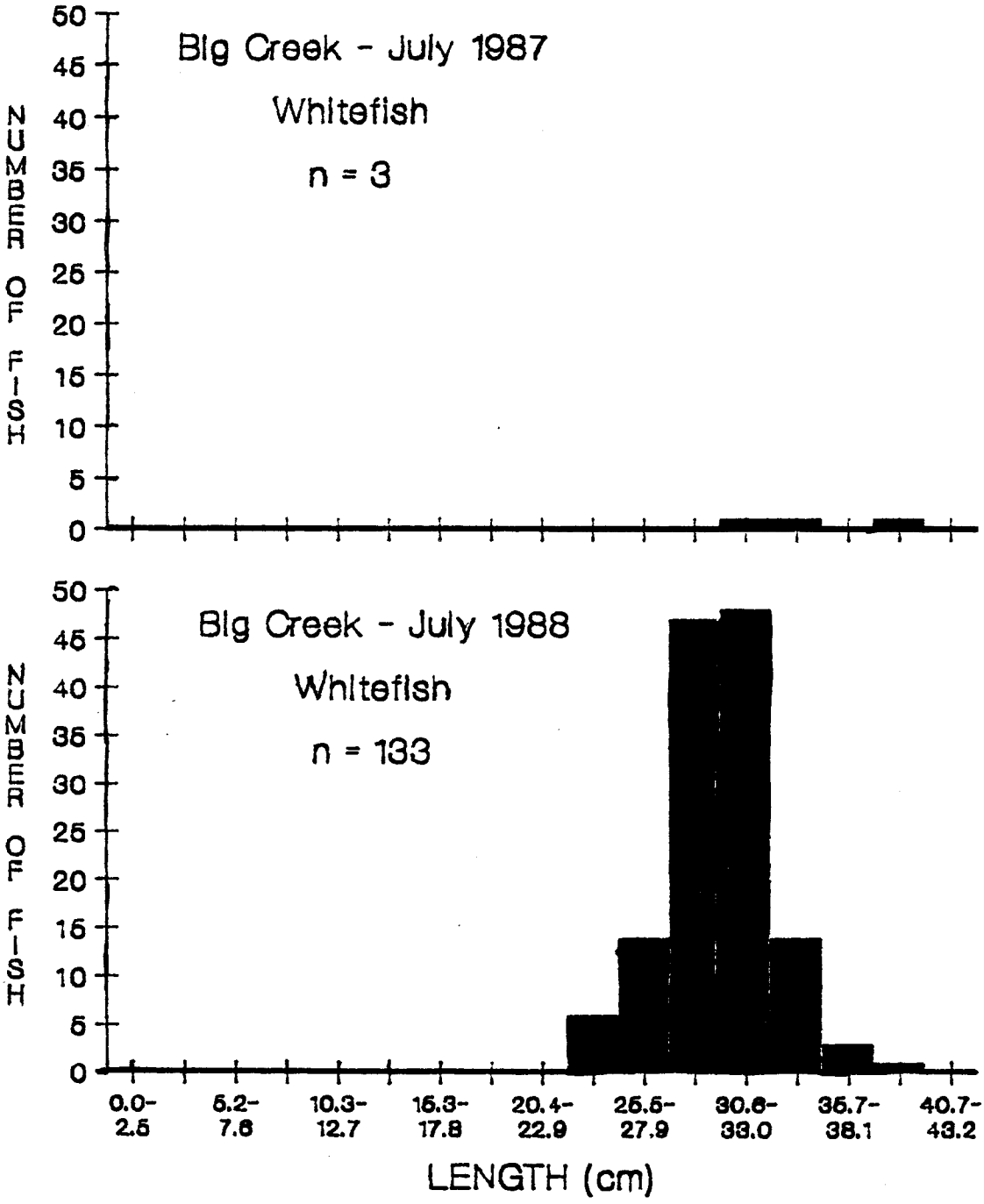



Figure 9. Length-frequency diagrams of mountain whitefish samples collected with hook-and-line from Big Creek in 1987 and 1988.

Table 2. Catch rates (fish/hour) per fish species sampled by hook and line from Big Creek (Middle Fork Salmon River drainage) in 1983, 1987, and 1988.

| Dates | Catch rate (fish/hour) | | | | |
|---|---|---|---|---|---|
| | Rainbow-steelhead trout | Cutthroat trout | Bull trout | Mountain whitefish | Combined |
| August 11-22, 1983 | 0.93 | 0.69 | 0.13 | | 1.75[a] |
| July 27-31, 1987 | 0.80 | 3.64 | 0.20 | 0.12 | 4.76[b] |
| July 29-31, 1988 | 1.79 | 8.19 | 0.45 | 2.83 | 13.26[c] |

[a]Water conditions in Big Creek were very turbid during sampling period from Monumental Bar downstream which affected catch rates. One angler expended 101 total hours effort.
[b]Two anglers expended 25 hours total effort.
[c]Two anglers expended 47 hours total effort.

Table 3. Number of fish per species observed while snorkeling four sections of the North Fork Payette River below Payette Lake, Idaho, on June 30, 1988.

| Stream section | Section area ($m^2$) | Species observed | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | HRB | WRB | MWF | NSQ | RSS | SCK | DA | SCU |
| Below McCall Hatchery outlet | 1,956.6 | 2 | 0 | 21 | 100 +[a] | 0 | 0 | 2 | few[b] |
| Below Sheep Bridge | 1,776.2 | 0 | 0 | 105 | 0 | 200 | 0 | 100 | -- |
| Swallow Hallow Area | 1,154.7 | 0 | 1 | 35 | 1,000 +[a] | 0 | 0 | 0 | -- |
| Hartsell (Smylie) Bridge Area | 1,369.0 | 0 | 0 | 30 | 150 | 500 + | 5 | 0 | -- |

[a]comprised primarily of young-of-the-year.
[b]following initial snorkeling sample, no attempt was made to-count sculpin.

HRB - Hatchery-rainbow trout

WRB - Wild/natural rainbow trout
MWF - Mountain whitefish

NSQ - Northern squawfish

RSS - Reside shiner

SCK - Sucker
DA - Dace

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Table 4. Summary of mean percent sediment composition by particle diameter size (mm) estimated from six samples each collected by core sampling and separately by ocular sampling from two sites on the North Fork Payette River above Payette Lake, Idaho, July 26, 1988. The appropriate 95% confidence limits (CA.) are shown in parentheses. The•data exhibited are aresine-transformed percentages.

| | Mean percent sediment composition +95% C.L. | | | |
|---|---|---|---|---|
| | Core sample | | Ocular sample | |
| Particle diameter size (mm) | Upstream site (+95 C.L.) | Downstream site (+95 C.L.) | Upstream site (+95 C.L.) | Downstream site (+95 C.L.) |
| Fine-coarse sediment (<4.75 mm) | 22.0 (16.4%-28.1%) | 26.7% (19.5%-34.7%) | 7.3% (4.7%-10.4%) | 16.0% (8.7%-25.2%) |
| Gravels (>4.75-76 mm) | 64.0% (53.50-74.0%) | 73.3% (65.5%-80.5%) | 71.0% (64%-78%) | 82.0% (74.6%-88.5%) |
| Rubble (>76-305 mm) | 12.0% (2.4%-27.5%) | 0.0% | 0.56%<0.0%-3.8%) | 21.5% (16.4%-27.5%) |

The kokanee spawning run in the North Fork Payette River in 1988 (began in early September and lasted through the beginning of November with a peak count of nearly 13,200 fish observed in mid-September (Figure 10). The number of mortalities started exceeding live fish between late September and early October.

The male:female ratio based on mortality data was 1.17:1.00. Males exhibited a larger mean fork length than females, 326 mm ± 18 mm SD (range 260 mm to 380 mm) compared to 306 mm + 14 mm SD (range 250 mm to 350 mm), respectively (Figure 11). With the sexes combined, kokanee possessed an average fork length of 317 mm + 19 mm SD with a range from 250 mm to 380 mm (Figure 12).

Of the 76 mature kokanee aged from the 1988 North Fork spawning run, 8% were age 3+, 74% were age 4+, and 18Z were age 5+. Modal size of age 3+ kokanee was 310 mm fork length, with age 4+ measuring 320 mm fork length and age 5+ having a bimodal distribution of 310 mm and 330 mm fork length (Figure 13).

Spawning escapement based on kokanee counts was estimated as approximately 26,000 fish.

## DISCUSSION

### Big Creek

Catch-and-release regulations have benefited the size structure and quality of the cutthroat trout fishery in Big Creek. Both mean size and catch rate of cutthroat trout documented by Fish and Game personnel have improved significantly since the regulation change. Big Creek provides one of the premier cutthroat trout fisheries in Idaho, if not the Intermountain West, and is certainly one of the remaining strongholds for the westslope subspecies of cutthroat trout. Other salmonid species certainly will derive benefits from the regulation over time.

Mining activities continue to be the major source of concern in the Big Creek drainage. Westslope cutthroat trout are suspected to be abundant and genetically pure in only about 4Z of the total range of the species. Strong populations are thought to currently exist in 11% of the historic range (B. Rieman, IDFG, interdepartmental memo). Habitat loss and fishing pressure are the prime factors leading to this dramatic decline. Every conceivable effort should be made by responsible management entities to safeguard this drainage from environmental damage to protect the existing anadromous and resident fisheries.

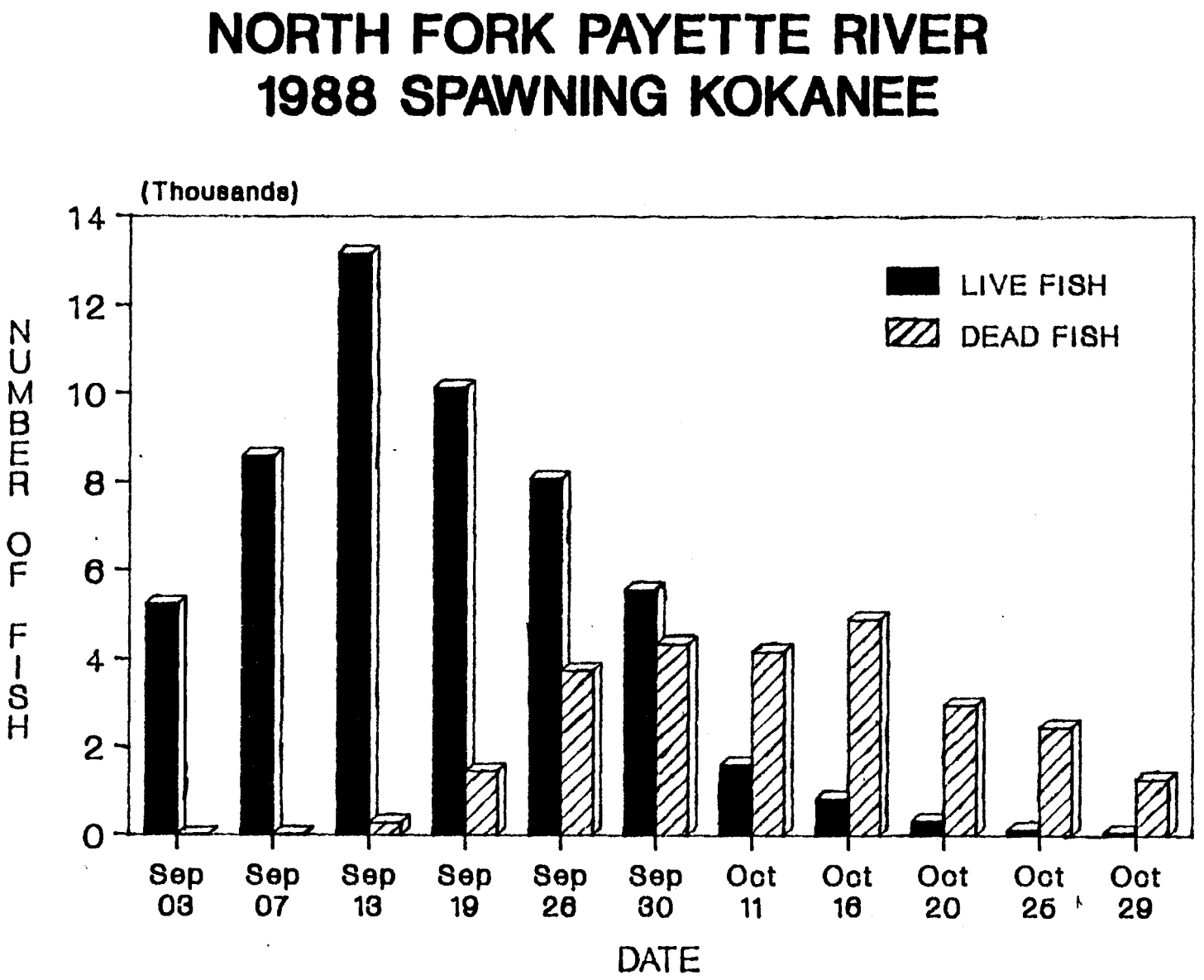


Figure 10. Bar graph diagram of number (thousands) of live and dead kokanee spawners enumerated in the North Fork Payette River above Payette Lake, Idaho, during September through October, 1988.

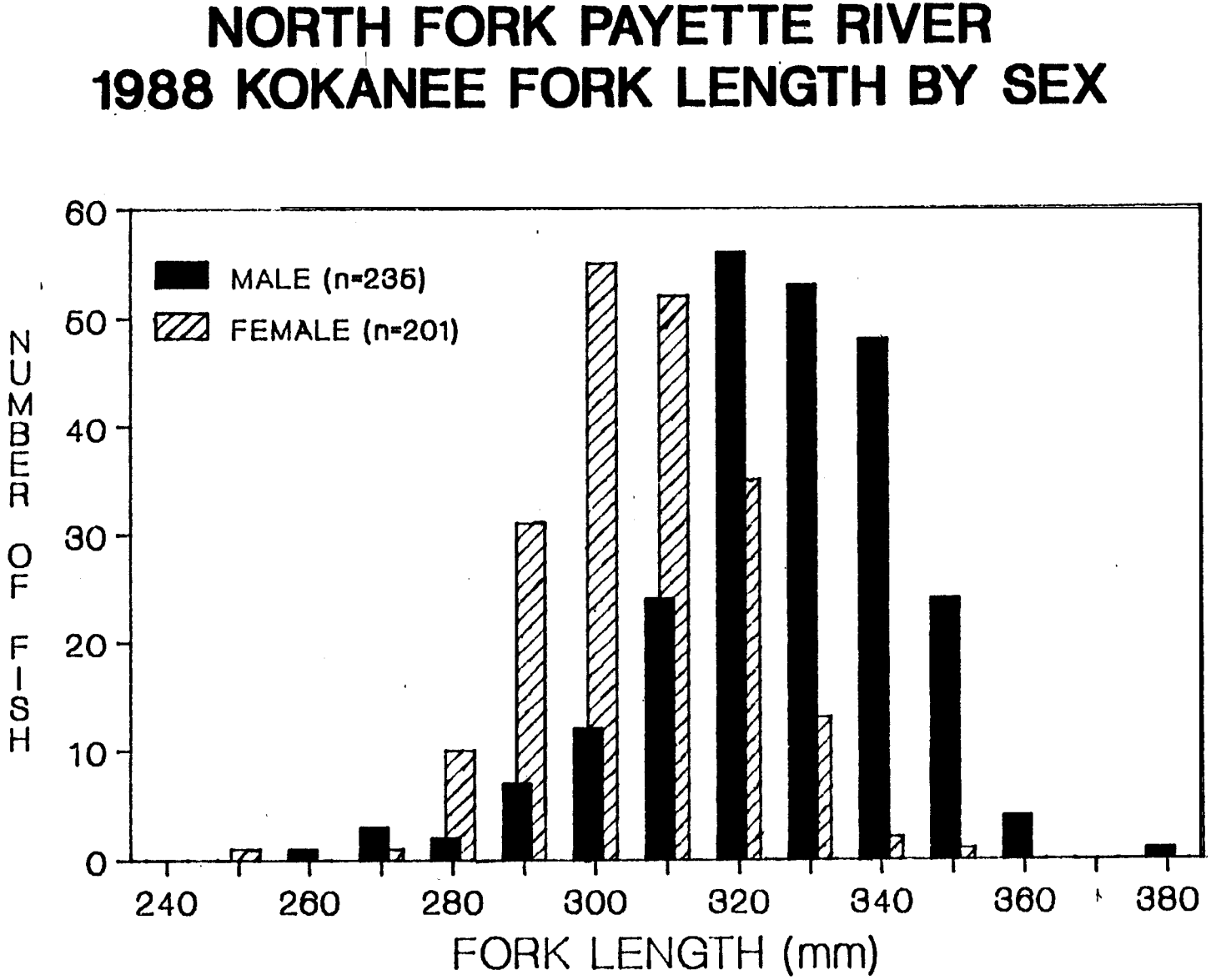


Figure 11. Bar graph diagram of fork length (mm) distribution of kokanee spawners by sex as sampled from specimens collected throughout the 1988 spawning run in the North Fork Payette River above Payette Lake, Idaho.

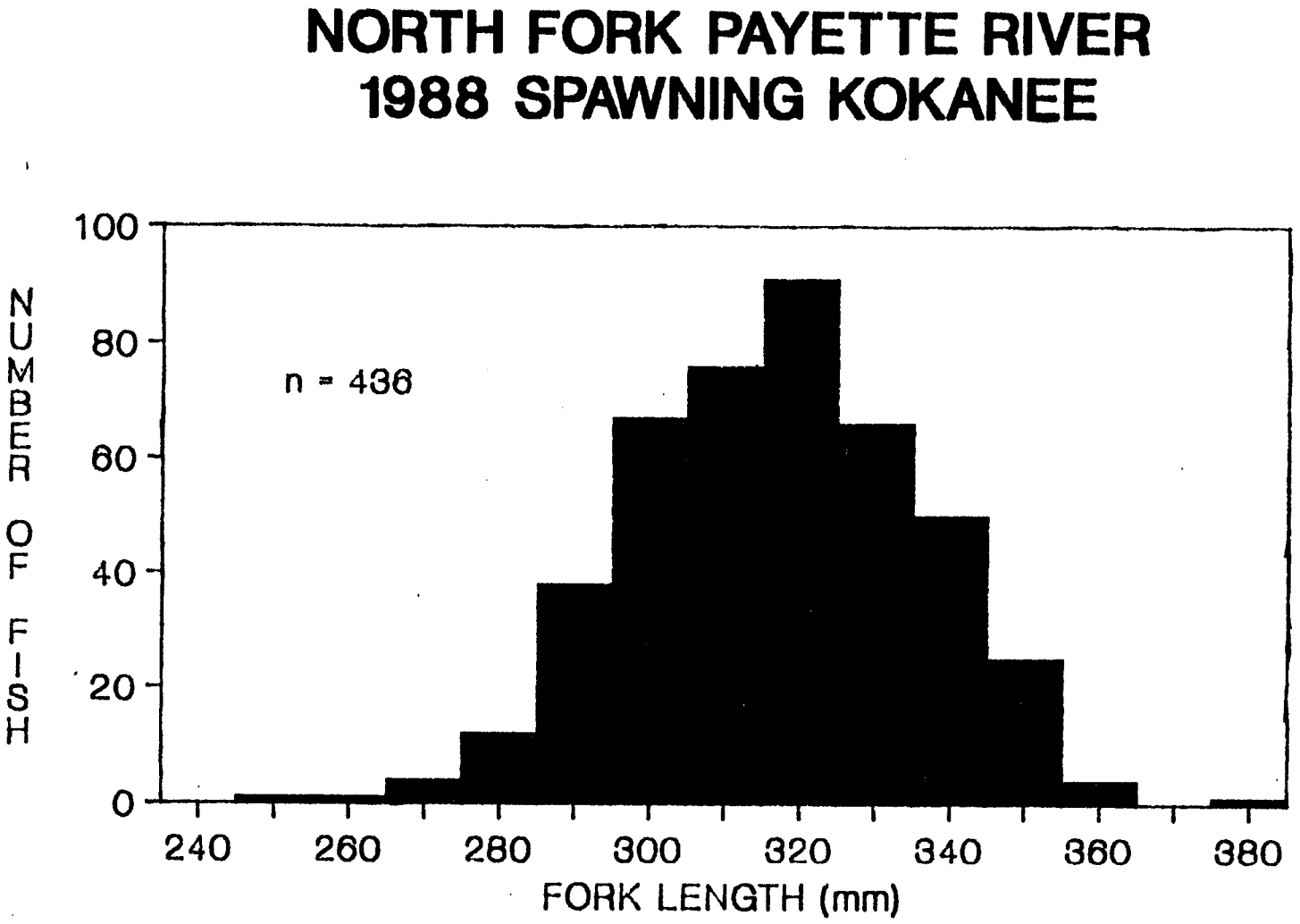


Figure 12. Length-frequency diagram of fork length (mm) distribution of kokanee spawners (sexes combined) as sampled from specimens collected throughout the 1988 spawning run in the North Fork Payette River above Payette Lake, Idaho.

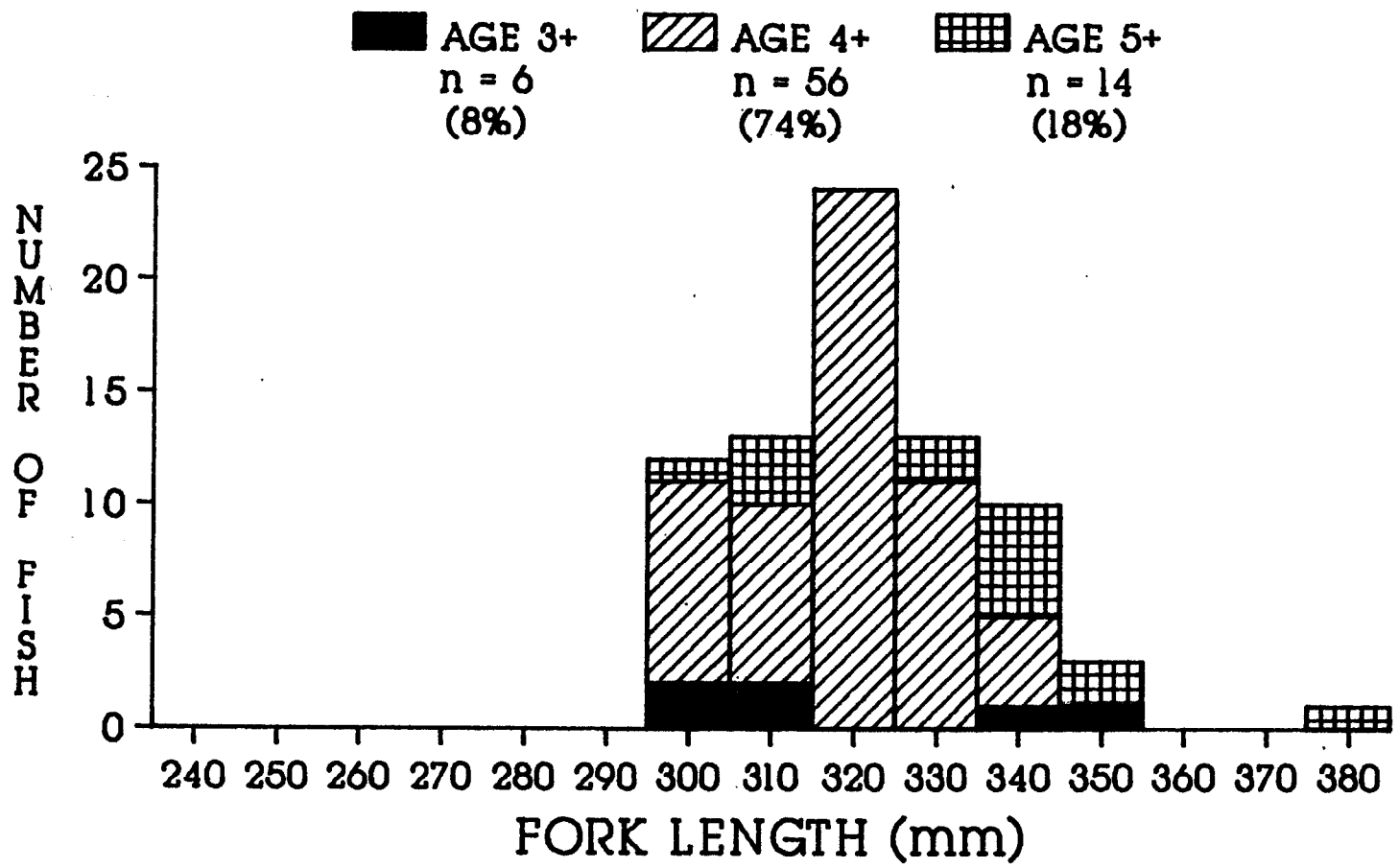


Figure 13. Fork length (mm) and age-frequency distribution of a sample of 76 kokanee spawners collected throughout the 1988 spawning run in the North Fork Payette River above Payette Lake, Idaho.

## North Fork Payette River

The seeming lack of success with brown trout stockings in the North Fork Payette River is not cause for immediate concern. Brown trout are a notably difficult species to observe using snorkeling techniques. Their propensity to be associated with bank cover or woody debris inherently limits direct observation. Snorkeling alone should not be used to assess the success of brown trout stockings but should be used in conjunction with other sampling techniques.

Brown trout were stocked initially in 1987 in the North Fork to fill the void left by the disappearance of rainbow trout. Brown trout were thought to possess certain qualities which would be conducive to their survival and establishment in the North Fork (Scully and Anderson 1989). A subcatchable plant of brown trout was made in late summer 1988 to improve survivability. In the late winter 1989, the IDFG received several angler reports of exceptional brown trout fishing in the North Fork below McCall. These stockings will continue in an attempt to establish a trout fishery in this river reach.

Physical manipulation of the substrate to improve condition of spawning gravels for kokanee succeeded in part by breaking the armoring which had developed and possibly made a larger amount of habitat available for use. The project was not designed to specifically test for differences in use by kokanee on treated versus untreated sites. Casual observations made throughout the spawning run suggested kokanee did not seemingly exhibit a preference for any of the ten treatment sites but were well distributed throughout the river reach (R. Bruce, biological aide, IDFG, personal communication).

In order to estimate spawning escapement the peak count of over 13,000 kokanee was simply doubled. This approximation is considered a minimum value and should only be considered as an index (B. Rieman, IDFG, personal communication). Future trapping of the spawning run and annual summer trawling estimates should make more accurate extrapolations possible.

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JOB PERFORMANCE REPORT

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

State of: Idaho

Title: McCall Subregion Technical Guidance

Project No.: F-71-R-13

Job No.: 3(MC)-d

Period Covered: January 1, 1988 to December 30, 1988


**ABSTRACT**

McCall Subregion fishery management personnel responded to 227 requests and opportunities for technical input. Comments were provided to state and federal agencies on proposed activities for which they have regulatory authority. Advice and technical assistance were provided for private businesses and the public on activities associated with fish, or having impacts on fish populations or fish habitat. The major topics of involvement included stream channel alterations, mining, and land management planning.

We also gave presentations to schools,' sportsperson groups, and civic organizations. We answered many questions from the angling public on fishing opportunities, regulations, techniques, and specific waters.



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## OBJECTIVES

1. To protect or minimize impacts to McCall area fisheries by providing technical fisheries input to government agencies with regulatory or land management authority.

2. To provide technical fisheries input, guidance, and advice to private entities and the general public.

3. To promote understanding of the environmental requirements of fish populations and appreciation of their values.

## RECOMMENDATIONS

1. Continue to provide technical fisheries input to the entities which most affect fish populations.

2. Continue to provide technical guidance and advice to private interests and the general public.

3. Expand efforts to educate the public in the environmental requirements for fish.

## RESULTS

Table 1 lists the public and private entities and number of contracts and responses made for each during 1988.

Table 1. Summary of technical guidance responses and activities by McCall Subregion fisheries management personnel in 1988.

| Agency or-individuals | Number of responses |
|---|---|
| U.S. Forest Service | |
| U.S. Bureau of Land Management | |
| U.S. Environmental Protection Agency | |
| U.S. Army Corps of Engineers | |
| U.S. Soil Conservation Service Idaho | |
| Department of Water Resources Idaho | |
| Department of Lands | |
| Idaho Department of Health & Welfare | |
| Idaho Department of Transportation | |
| Idaho Outfitters & Guides Board | |
| Health Districts | |

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Table 1. Continued.

| Agency or individuals | Number of responses |
|---|---|
| Hydroelectric developers | 12 |
| Private fish pond owners | 10 |
| Public meetings and presentations | 15 |
| Mining | 24 |
| County Commissions | 3 |
| LeBois Resort developers | 6 |
| U.S. Fish & Wildlife Service | 3 |
| Bureau of Reclamation | 2 |
| Nez Perce Tribe | 5 |
| Soil Conservation Service | 4 |
| Little Salmon River spill contacts | 18 |
| Total | 227 |

JOB PERFORMANCE REPORT

State of: Idaho

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Project No.: F-71-R-13

Title: McCall Subregion Salmon and Steelhead Investigations

Job No.: 3(MC)-e

Period Covered: January 1, 1988 to December 30, 1988

**ABSTRACT**

Region 3 (MC) salmon and steelhead investigation data are incorporated in a separate, statewide "Salmon and Steelhead Investigations" report.

Author:

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**ACKNOWLEDGEMENTS**

Much of the data used in this report was collected by Fish and Wildlife Technician Billy D. Arnsberg and Biological Aide Shaun Bass. Their contributions are gratefully acknowledged.

Technical support was provided by Ed Bowles, John Lund, Russ Thurow, Virgil Moore, Bruce Rieman, Ed Buettner, and Russ Kiefer.

We especially would like to acknowledge Dick Scully for supervising the collection of most of the enclosed information.

Thanks are extended to Judy Wallace for putting this report together.

# A P P E N D I C E S

APPENDIXI

Appendix 1. Summary of Upper Payette Lake hatchery planting records, 1967 to 1988.

| | | | |
|---|---|---|---|
| 1967 | rainbow trout | 4,740 | catchable |
| 1968 | rainbow trout | 1,920 | catchable |
| 1969 | Nothing planted | | |
| 1970 | rainbow trout | 10,320 | catchable |
| | rainbow trout | 76,650 | fry |
| | cutthroat trout | 11,100 | fry |
| 1971 | rainbow trout | 12,600 | catchable |
| | rainbow trout | 58,464 | fry |
| | cutthroat trout | 20,160 | fry |
| 1972 | rainbow trout | 6,432 | catchable |
| | rainbow trout | 81,000 | fry |
| | cutthroat trout | 54,000 | fry |
| 1973 | rainbow trout | 8,320 | catchable |
| | rainbow trout | 46,800 | fry |
| 1974 | rainbow trout | 2,430 | catchable |
| | rainbow trout | 36,000 | fry |
| 1975 | rainbow trout | 8,810 | catchable |
| 1976 | rainbow trout | 9,600 | catchable |
| 1977 | rainbow trout | 5,760 | catchable |
| | rainbow trout | 24,960 | fry |
| 1978 | rainbow trout | 10,080 | catchable |
| 1979 | rainbow trout | 12,000 | catchable |
| 1980 | rainbow trout | 8,370 | catchable |
| 1981 | rainbow trout | 18,070 | catchable |
| | rainbow trout | 39,520 | subcatchabl |
| | rainbow trout | 23,200 | fry |

Appendix 1. (Continued)

| Year | Species | Number | Size category |
|---|---|---|---|
| 1982 | rainbow trout (unspecified stock) | 11,530 | catchable |
| 1983 | NO LISTING - | | |
| 1984 | rainbow trout (unspecified & Mt. Whitney) | 19,977 | catchable |
| 1985 | rainbow trout (unspecified stock) | 19,044 | catchable |
| 1986 | rainbow trout (unspecified & Mt. Lassen) | 20,450 | catchable |
| 1987 | rainbow trout (unspecified & Mt. Lassen) | 19,500 | catchable |
| | rainbow trout (McConnaughy) | 117,646 | subcatchable |
| 1988 | rainbow trout (unspecified & Mt. Lassen) | 20,092 | catchable |

APPENDIXI

Appendix 2. Fulton condition factor (K) for a sample (n=97) of domestic kamloops rainbow trout prior to stocking in Little Payette Lake, May 23, 1988.

| Total length (mm) | Weight (grams) | K |
|---|---|---|
| 226 | 135 | 1.17 |
| 220 | 114 | 1.07 |
| 203 | 106 | 1.27 |
| 211 | 110 | 1.17 |
| 222 | 96 | 0.88 |
| 212 | 90 | 0.94 |
| 207 | 104 | 1.17 |
| 206 | 108 | 1.24 |
| 212 | 104 | 1.09 |
| 202 | 118 | 1.43 |
| 204 | 102 | 1.20 |
| 230 | 140 | 1.15 |
| 193 | 82 | 1.14 |
| 203 | 92 | 1.10 |
| 245 | 155 | 1.05 |
| 204 | 82 | 0.97 |
| 230 | 120 | 0.99 |
| 191 | 100 | 1.44 |
| 215 | 112 | 1.13 |
| 228 | 150 | 1.27 |
| 212 | 102 | 1.07 |
| 202 | 90 | 1.09 |
| 212 | 98 | 1.03 |
| 195 | 82 | 1.11 |
| 190 | 78 | 1.14 |
| 210 | 98 | 1.06 |
| 211 | 114 | 1.21 |
| 208 | 98 | 1.09 |
| 208 | 92 | 1.02 |
| 220 | 98 | 0.92 |
| 226 | 130 | 1.13 |
| 222 | 98 | 0.90 |
| 230 | 128 | 1.05 |
| 181 | 64 | 1.08 |
| 199 | 78 | 0.99 |
| 225 | 126 | 1.11 |
| 205 | 82 | 0.95 |
| 242 | 145 | 1.02 |
| 246 | 180 | 1.21 |
| 217 | 120 | 1.17 |
| 176 | 62 | 1.14 |
| 210 | 102 | 1.10 |
| 224 | 118 | 1.05 |
| 224 | 130 | 1.16 |

Appendix 2. (Continued)

| Total length (mm) | Weight (grams) | K |
|---|---|---|
| 240 | 170 | 1.23 |
| 205 | 104 | 1.21 |
| 226 | 130 | 1.13 |
| 196 | 84 | 1.12 |
| 206 | 98 | 1.12 |
| 241 | 130 | 0.93 |
| 218 | 122 | 1.18 |
| 225 | 120 | 1.05 |
| 218 | 116 | 1.12 |
| 201 | 74 | 0.91 |
| 198 | 92 | 1.19 |
| 208 | 102 | 1.13 |
| 187 | 82 | **1.25** |
| 250 | 170 | 1.09 |
| 199 | 80 | 1.02 |
| 238 | 150 | 1.11 |
| 211 | 108 | 1.15 |
| 212 | 114 | 1.20 |
| 226 | 118 | 1.02 |
| 216 | 114 | 1.13 |
| 207 | 82 | 0.92 |
| 197 | 84 | 1.10 |
| 212 | 106 | 1.11 |
| 193 | 88 | 1.22 |
| 213 | 106 | 1.10 |
| 205 | 100 | 1.16 |
| 214 | 106 | 1.08 |
| 220 | 130 | 1.22 |
| 217 | 122 | 1.19 |
| 227 | 130 | 1.11 |
| 231 | 150 | 1.22 |
| 180 | 68 | 1.17 |
| 192 | 66 | 0.93 |
| 217 | 108 | 1.06 |
| 217 | 130 | 1.27 |
| 211 | 110 | 1.17 |
| 204 | 92 | 1.08 |
| 220 | 140 | 1.31 |
| 197 | 78 | 1.02 |
| 177 | 66 | 1.19 |
| 260 | 190 | 1.08 |
| 210 | 112 | 1.21 |
| 221 | 120 | 1.11 |
| 205 | 112 | 1.30 |
| 185 | 70 | 1.11 |
| 215 | 114 | 1.15 |
| 216 | 124 | 1.23 |
| 222 | 122 | 1.12 |

Appendix 2. (Continued)

| Total length (mm) | Weight (grams) | K |
|---|---|---|
| 222 | 112 | 1.02 |
| 225 | 122 | 1.07 |
| 196 | 74 | 0.98 |
| 202 | 94 | 1.14 |
| 218 | 116 | 1.12 |

Mean K = 1.10 + 0.14 (standard deviation)

APPENDIXI

Appendix 3. Fulton condition factor (K) for a sample (n=16) of Pennask Lake rainbow trout collected with horizontal gill nets from Little Payette Lake, September 27-28, 1988.

| Total length (mm) | Weight (grams) | K |
|---|---|---|
| 161 | 36 | 0.86 |
| 148 | 14 | 0.43 |
| 155 | 36 | 0.97 |
| 170 | 44 | 0.90 |
| 155 | 31 | 0.83 |
| 141 | 23 | 0.82 |
| 158 | 41 | 1.04 |
| 158 | 34 | 0.86 |
| 152 | 37 | 1.05 |
| 165 | 40 | 0.89 |
| 163 | 40 | 0.92 |
| 185 | 58 | 0.92 |
| 161 | 42 | 1.01 |
| 162 | 37 | 0.87 |
| 243 | 160 | 1.12 |
| 236 | 120 | 0.91 |

Mean K = 0.90 + 0.15 (standard deviation)

APPENDIXI

Appendix 4. Summary of Payette Lake stocking records, 1946 to 1988.

| Year | Species | Number | Size category |
|---|---|---|---|
| 1946 | rainbow trout | 3,000 | |
| 1955 | lake trout[a] | 9,550 | subcatchable |
| 1959 | lake trout | 11,760 | subcatchable |
| 1960 | rainbow trout | 95,720 | fry and catchable |
| | lake trout | 8,025 | subcatchable |
| 1961 | rainbow trout | 137,680 | fry and catchable |
| | lake trout | 8,820 | subcatchable |
| 1962 | rainbow trout | 73,600 | fry, fingerling, catchable |
| | lake trout | 10,062 | subcatchable |
| | kokanee | 49,500 | fry |
| 1963 | rainbow trout | 26,650 | fingerling and catchable |
| | lake trout | 34,400 | subcatchable |
| | kokanee | 26,000 | fry |
| 1964 | rainbow trout | 9,520 | catchable |
| | kokanee | 67,500 | fry |
| 1965 | lake trout | 9,600 | subcatchable |
| | kokanee | 261,000 | fry |
| | rainbow trout | 22,080 | catchable |
| 1966 | lake trout | 10,002 | subcatchable |
| | kokanee | 231,820 | fry |
| | rainbow trout | 17,870 | catchable |
| | Mysis shrimp | 100,000 | |
| 1967 | lake trout | 15,178 | subcatchable |
| | kokanee | 205,000 | fry |
| | rainbow trout | 12,390 | catchable |
| | rainbow trout | 33,600 | fingerling |
| | cutthroat trout | 102,000 | fingerling |
| | Mysis shrimp | 100,000 | |
| 1968 | lake trout | 15,178 | subcatchable |
| | kokanee | 150,400 | fry |
| | rainbow trout | 23,860 | catchable |
| | rainbow trout | 34,740 | fingerling |
| | cutthroat trout | 31,128 | fingerling |
| | Mysis shrimp | 100,000 | |

APPENDIXI

Appendix 4. (Continued)

| Year | Species | Number | Size category |
|---|---|---|---|
| 1969 | lake trout | 12,750 | subcatchable |
| | kokanee | 151,900 | fry |
| | rainbow trout | 21,240 | catchable |
| 1970 | kokanee | 177,327 | fry |
| | rainbow trout | 24,690 | catchable |
| 1971 | lake trout | 10,800 | subcatchable |
| | kokanee | 220,000 | fry |
| | rainbow trout | 21,660 | catchable |
| 1972 | rainbow trout | 30,040 | catchable |
| | lake trout | 7,221 | subcatchable |
| 1973 | rainbow trout | 15,790 | catchable |
| | lake trout | 37,904 | fry |
| 1974 | rainbow trout | 8,640 | catchable |
| | lake trout | 29,950 | subcatchable to catchable |
| 1975 | rainbow trout | 21,360 | catchable |
| | lake trout | 29,184 | fingerling |
| | kokanee | 138,000 | fry |
| 1976 | rainbow trout | 24,330 | catchable |
| | kokanee | 87,500 | fry |
| | cutthroat trout | 31,000 | fry |
| 1977 | rainbow trout | 93,030 | fry, fingerling, catchable |
| 1978 | rainbow trout | 21,060 | catchable |
| 1979 | rainbow trout | 14,690 | catchable |
| | lake trout | 32,136 | fingerling |
| 1980 | rainbow trout | 20,520 | catchable |
| | lake trout | 2,560 | subcatchable |
| 1981 | rainbow trout | 30,190 | catchable |
| | lake trout | 78,077 | fry |
| 1982 | rainbow trout | 20,760 | catchable |
| | lake trout | 84,700 | fry and fingerling |
| 1983 | rainbow trout | 17,939 | catchable |
| | lake trout | 27,400 | subcatchable |

Appendix 4. (Continued)

| Year | Species | Number | Size category |
|---|---|---|---|
| 1984 | rainbow trout | 20,000 | catchable |
| | lake trout | 50,184 | fry |
| 1985 | rainbow trout | 19,927 | catchable |
| | lake trout | 46,140 | fingerling |
| 1986 | rainbow trout | 24,851 | catchable |
| 1987 | rainbow trout | 17,184 | catchable |
| 1988 | rainbow trout | 21,000 | catchable |
| | cutthroat trout | 29,350 | catchable |
| | kokanee | 300,26 | fingerling |

[a]first introduction of lake trout to Payette Lake.

Appendix 5. Summary of kokanee stocks planted in Payette Lake, 1962 to 1988

| Year | Source of. parent stock | Approximate spawning time[a] |
|---|---|---|
| 1962 | Pend Oreille | late |
| 1963 | Pend Oreille | late |
| 1964 | Pend Oreille | late |
| 1964 | Trout Lodge | early |
| 1965 | Island Park | early |
| 1967 | Trout Lodge | early |
| 1968 | Pend Oreille | late |
| 1968 | Trout Lodge | early |
| 1969 | Anderson Ranch | early |
| 1970 | Anderson Ranch | early |
| 1970 | Island Park | early |
| 1971 | Anderson Ranch | early |
| 1975 | Anderson Ranch | early |
| 1976 | Anderson Ranch | early |
| 1988 | Deadwood Reservoir | early |

[a]Spawning times for kokanee stocks as described in file memoranda; early stocks range from August 10-September 20 and September 10-November 10, while late stocks spawn from mid-November to. late December.

Appendix 6. Mean zooplankton densities (organism/liter) found in Payette Lake, Idaho, 1988, compared among sampling dates. Data were collected from five sites around the lake during 1988 for each sample date except for July where four samples were taken.

| | Mean organisms/liter | | |
|---|---|---|---|
| Organism | May | July | August |
| Copepoda | 7.159 | 5.089 | 4.315 |
| Daphnia | 0.265 | 1.086 | 1.270 |
| Bosmina | 0.351 | 4.413 | 0.398 |
| Holopedium | 0 | 0 | 0.180 |
| Diaphanosoma | 0 | 0 | 0.028 |
| Leptodora | 0.023 | 0.012 | 0.017 |
| Polyphemus | 0 | 0.012 | 0.030 |
| Total | 7.775 | 10.612 | 6.238 |

Appendix 7. Mean zooplankton densities (organisms/liter) found in Payette Lake, Idaho, 1988, compared among lake sampling sites. Data were collected May, July and August of 1988. In July, the south end-east arm had no data collected.

| | Lake Section | | | | |
|---|---|---|---|---|---|
| Organism | Middle east | South east | Middle west | South west | North |
| Copepoda | 23.739 | 11.572 | 13.668 | 18.861 | 9.886 |
| Daphnia | 2.984 | 1.390 | 3.417 | 2.152 | 2.075 |
| Bosmina | 9.242 | 0.898 | 2.345 | 0.841 | 8.071 |
| Holopedium | 0.301 | 0.090 | 0.221 | 0.271 | .016 |
| Diaphanosoma | 0 | 0 | 0.020 | 0.030 | 0.035 |
| Leptodora | 0 | 0 | 0.035 | 0 | 0.017 |
| Polyphemus | 0.042 | 0 | 0 | 0.030 | 0 |
| Totals | 36.308 | 13.950 | 19.706 | 22.185 | 22.100 |

Appendix 8. Mean zooplankton body length (mm) per organism found in Payette lake, Idaho, 1988, compared among sampling dates.

| Organism | Mean body length (mm) | | |
|---|---|---|---|
| | May | *July* | August |
| Leptodora | | | 1.20 |
| Holopedium | | | 0.82 |
| Daphnia | 0.79 | 0.84 | 0.68 |
| Copepoda | 0.50 | 0.50 | 0.45 |
| Bosmina | 0.21 | 0.22 | 0.22 |

Appendix 9. Summary of miscellaneous spot creel checks performed June through October 1988, near the Taylor Ranch on Big Creek, Middle Fork Salmon River drainage.

| Month | Total hours fishing | Catch rate by species (fish/hour) | | | | |
|---|---|---|---|---|---|---|
| | | Rainbow/ steelhead trout | Cutthroat trout | Bull trout | Mountain whitefish | Total |
| June | 6.50 | 0.0 | 2.60 | 0.0 | 0.80 | 3.40 |
| July | 12.50 | 0.88 | 2.90 | 0.0 | 0.56 | 4.34 |
| August | 6.50 | 1.20 | 2.20 | 0.31 | 0.62 | 4.33 |
| September | 7.75 | 0.0 | 2.20 | 0.0 | 0.0 | 2.20 |
| October | 3.25 | 0.0 | 2.80 | 0.31 | 0.0 | 3.11 |

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